WORKING-PLANS REPORT

OF THE

FORESTS NEAR DARJEELING.

1891.

Prepared under the supervision of the Conservator of Forests, Bengal,

BY

MR. F. B. MANSON,

DEPUTY CONSERVATOR OF FORESTS,

ASSISTED BY

MR. H. H. HAINES AND THE LATE MR. F. C. HENVEY,

ASSISTANT CONSERVATORS OF FORESTS.

Extract from a letter from T. W. RICHARDSON, ESQ., *Under-Secretary to the Government of Bengal, Revenue Department, to the Conservator of Forests, Bengal,—No.* 300*For., dated Calcutta, the 20th January* 1893.

PARA. 1. With reference to the correspondence ending with Government order No. 103For., dated the 17th February 1891, I am directed to forward, for your information, the accompanying copy of a letter from the Inspector-General of Forests to the Government of India, No. 161W.P., dated the 22nd December 1892, and to say that, under the provisions of section 88 of the Forest Department Code, fourth edition, the Lieutenant-Governor is pleased to approve the Working Plan for the Forests near Darjeeling, as finally sanctioned by the Inspector-General. The provisions of the Plan should be brought into effect from the 1st April 1893.

No 161W.P., dated Calcutta, the 22nd December 1892.

From—B. RIBBENTROP, ESQ., C.I.E., Inspector-General of Forests to the Government of India,

To—The Secretary to the Government of Bengal, Revenue Department.

IN accordance with the provisions of section 69 of the Forest Code, third edition, I have the honour to forward, for the orders of the Local Government, a Working Plan for the Forests near Darjeeling

2. I am of opinion that Part I of the Working Plans Report is somewhat lengthy, but it may be remembered that the history of the reserves therein set forth is complicated, while the variety of climatic and other conditions relating to this special locality is such that this portion of the report could not well have been written briefly. The completeness of Part I will always be useful to the local officers.

3. Part II of the Report, the Working Plan proper, is clear and sufficiently detailed. It shows that the compiler, Mr Manson, acquired a thorough grasp of the questions with which he had to deal, while the sylvicultural knowledge displayed is remarkable. No trouble has been spared in the collection of the necessary information and in the compilation of the working scheme.

4. I approve of the plan and recommend that it be sanctioned, and its provisions brought into effect from the 1st April 1893.

No. 94, dated Calcutta, the 11th February 1888.

From—B. RIBBENTROP, ESQ., Inspector-General of Forests to the Government of India,

To—The Secretary to the Government of Bengal, Revenue (Forests) Department.

I HAVE the honour to submit, for the orders of His Honour the Lieutenant-Governor, a proposed Working Plan for the Forests near Darjeeling, drawn up by Mr. E. G. Chester, Deputy Conservator of Forests, together with two Notes by Mr. E. E. Fernandez, Assistant Inspector-General of Forests and Superintendent of Working Plans, criticising the Plan in question. I beg to draw attention to the fact that Mr. Fernandez examined the forests to which the Working Plan refers before he wrote his second Note.

2. In my opinion the plan should not be approved in its present form. The facts on which the general scheme is based are scattered about and quite insufficient, the general scheme itself is wrongly described and confused, and the detailed prescription and location of forest operations 205 years ahead stamp the proposed Plan as impracticable.

3. The Assistant Inspector-General of Forests has pointed out how utterly insufficient the descriptive part is, and how wanting it is in the information required to serve as the ground-work of the prescriptive part, the proposals of which are consequently only suggestions hanging in the air. Thus the rate of growth has not been ascertained, but the rotation has been arbitrarily fixed at 108 years. The reason given for adopting this period—viz., that it is necessary in order to be able to close the forests for 50 or 60 years—is not tenable in the face of the estimate of the annual outturn, and Mr. Fernandez emphatically contradicts it.

4. The method of sylvicultural treatment suggested for the forests is regeneration by means of two successive fellings with an interval of 10 years between, the existing advance growth to be taken advantage of in the first felling in order, as rapidly as possible, to differentiate and concentrate the various age-classes on separate areas, with a view to meet the grazing requirements with the least amount of resulting damage to forest. But it is quite impossible to gather from paragraph 31 that this is the method meant. Mr. Fernandez's description of the limited influence of grazing on the forests, and of the ruined condition of the old stock, make me, however, doubt the advisability of the method suggested, as by it some of the already deteriorating stock will only be felled after 107 years, and the question, therefore, requires reconsideration by the light of the present observations.

5. To ascertain the system adopted for the regulation of the work, I naturally turn to the author's description thereof. On this subject he states, in paragraph 33, that he has adopted volume capability as a basis, but that, submitting to my opinion, he has applied a check-area of one-eighteenth of the extent of the Working-Circle, instead of one-fourth or one-fifth as originally proposed by him. He says that the reduction of the size of the check-area subordinates sylvicultural considerations to a desire for simplicity of management. This, in the absence of any further explanation than what is contained in Mr. Chester's Memorandum of February 1887, I do not understand, since the selection of the compartments to be worked would rest with the Working Plans Officer and be subject to revision at least once every 10 years. (See my letter to the Conservator of Forests, No. 222, dated 19th April 1887.) That the location of operations would be contemplated for 205 years in advance, I could not of course foresee.

It having been decided by the author to regulate the working of the forests on the basis of their capability gauged by volume of material, I naturally look for an elaborate enumeration of the growing stock and a calculation of the increase in volume expected, based on detailed observations; but I find nothing of the kind. The enumeration comprises 2,389 acres (whether typical or not is not even stated); but it is, in any circumstances, insufficient if volume of material is to be the basis of the Plan. I find, next, that the volume has been calculated on the strength of the measurement of an utterly insufficient number of type trees; then that the entire standing stock has been regarded by the author as a mere accumulation of stems that are incapable of any further growth; and, finally, that the general capability of the forest in volume of material has not been used as the basis of the Plan.

6. The real basis of the proposed general Working Plan is contained in the working tables (pages 16 and 17), and the ground-work is area.

The 18 sub-divisions are said to be of the same capability, but this is pure guess-work and is probably incorrect, as no calculations have been made as regards the increase of the growing stock. I have already pointed out that the last area to be taken up is supposed to come under working for the first time 105 years hence—a very undesirable proceeding. The author himself feels the unreliability of his calculation with regard to the capability of the forest, and has consequently limited himself to enumerating the mature stock on only 590 acres, the area which he proposes to work during the first three years. He practically says:—"Fell during three years over the whole of this area, but not more than one-half of the total stock, less 20 per cent. or 40 per cent. of the volume ascertained by enumeration." This outturn is estimated at 8,200 cords. The author prescribes before the end of three years an enumeration of the trees in the next check-area, which is to be treated in the same manner as the first three compartments, and so on. I have no doubt that if this method is judiciously applied—that is, if the areas are periodically selected, with due regard to their condition as regards advance growth—the forests will not be overworked; but it is quite possible that they will be worked far below their capabilities, and that a considerable amount of deteriorating material will be wasted, as well as part of the productive power of the forest area, *i.e.*, the prospective increase that can be secured by eliminating the inferior elements of the present mixed stock and allowing its place to be taken by vigorous young growth. This end could be attained by means of a quicker succession of cuttings; but it is possible that the sacrifice demanded by Mr. Chester's

Plan is unavoidable, if—which, however, I do not believe to be the case—it is really necessary to close areas against grazing for 54 years. This is a point in the Working Plan which would seem to require reconsideration.

7. Mr. Fernandez's remarks in paragraph 4 of his second Note, referring to the faulty selection of the compartments selected for felling during the first six years in the Western Circle, require to be carefully weighed. The selection is evidently made in opposition to the sylvicultural principles laid down by Mr. Chester himself.

8. I quite agree with the proposals made in paragraph 12 of Mr. Fernandez's second Note, which I beg to recommend for consideration.

The proposal made by Mr. Chester in paragraph 61, with regard to the sale of material in the forest, commends itself to me, and, if adopted, the planters will have no cause to complain that their interests are neglected in favour of those of the inhabitants of Darjeeling and Jalapahar.

I beg also to draw attention to the last paragraph of Mr. Fernandez's second Note, regarding the construction of sledge-ways.

MR. CHESTER'S *Working Plan of the Forests near Darjeeling.*

THE forests for which the Working Plan has been framed constitute a portion of the Darjeeling Forest sub-division. In 1879, Dr. (now Sir) D. Brandis drew up a rough Working Plan for some forests near Darjeeling, which were to be exploited for the supply of that station and Jalapahar. That Working Plan was further elaborated by Dr. Schlich in 1882, and has hitherto been more or less acted up to. The plan now sent up for approval evidently includes a large portion, if not the whole, of the area provided for by Dr. Schlich's plan; but Mr. Chester omits all mention of this latter. This omission is much to be regretted, as a review of the provisions of the old plan in the light of the experience gained during the seven or eight years that it has been enforced, would be of incalculable utility both in framing and in discussing the plan now submitted. The Working Plans Officer should, I think, be required to supply such a retrospective review before his plan can be approved.

Certainly. F. B.

2. Before proceeding to review the Working Plan, I must solicit attention to the faulty arrangement of the matter in it, whereby many statistical facts, which would have found their proper place in Chapter I, have been mixed up with the prescriptions, which alone should constitute Chapter III. To give examples, the facts I refer to are such as are described in clauses 2—5 of paragraph 31, clauses 2—7 of paragraph 56, clauses 1—5 of paragraph 58, in paragraph 62, and the first of clause I of paragraph 63.

The report should be re-arranged. F. B.

3. Chapters I and II do not contain sufficiently full information, with the help of which to scrutinise the prescriptive part (Chapter III) or the Working Plan proper. The size attained by the various species enumerated in paragraph 15, the rates of growth, and the requirements of the more important from among them ought to have been given. Moreover, we should have been told which of them yield timber. Champ is said to be one of the "best trees," but nothing is said regarding its abundance beyond that it forms about one-seventh of the number of stems 9 inches and upwards in diameter. The prices commanded by the different kinds of wood and the extent to which they are in demand should not have been altogether omitted. It is said that coal can be delivered in Darjeeling at Re. 1 per maund, and that it has in some cases displaced firewood; but in the absence of figures relating to the latter fuel, it is impossible to judge whether, when the nearer portions of the forests have been exploited, the increased cost of transport may not drive wood out of the market to such an extent as to render a very large portion of the forests quite unworkable. We must be sure that every portion of the area brought under the provisions of the Working Plan can be worked in a constant manner.

Information should be given. F. B.

4. In paragraph 15 it is said that the crop is, generally speaking, complete, but we are nowhere told to what extent grass comes up under the standing crop. If there is little or no grass, the amount of pasturage per acre must be insignificant, unless young trees and low shrubs are abundant and are eaten by cattle.

Information should be given. F. B.

In paragraph 20 it is stated that the "damage done by grazing is so great that the *quantity* as well as the *quality* of the yield of the forest is seriously affected by it." But in paragraph 58 the grazing and the lopping are reported to affect "the *quality* rather than the *quantity* of the outturn," and the grazing rules allow only chindia, dudila, and brambles to be lopped. With such meagre and even contradictory information before us, we cannot, without an intimate personal knowledge of the forests in question, pass any opinion on the arrangements proposed by Mr. Chester for the regulation of the grazing. Those arrangements may be excellent, but the fact remains that the Inspector-General of Forests, as the approving authority, is not

I agree in this. F. B.

enabled to pass any opinion on them. The maximum numbers of animals to provide for are, according to Appendix 1, respectively 315 for the whole year and 350 for the six months from 1st April to 31st October, that is to say, an average of 315 + ½ of 350 = 490 for the entire twelve month. This gives as large an average area as 35 acres per head. Actually the number of animals has been very much less than the authorised maximum.

The grazing appears to be very light. F. B.

5. As regards the composition and quantity of the stock, Mr. Chester has made complete enumeration surveys over (1) the 590 acres which he proposes to work during the first three years of the Working Plan, and (2) over 2,389 acres (2,389 in paragraph 58, but 2,743 in Appendix 4) elsewhere. The latter area was surveyed "with a view to obtaining more exact figures as a general average annual capability for the whole of the rotation" The figure he thus obtains for this general average capability is about 54 solid cubic feet per acre per annum (inclusive of chilndia and dudila). In paragraph 37 he says that even a properly conserved crop grows up so slowly that a term of 54 years is "scarcely sufficient to ensure the young crop growing up to a size beyond the reach of much harm from cattle." In the irrigated plantation of Changa Manga, with so fast growing a species as sissu and perfectly level land, every inch of which outside the roads is productive, the average outturn per acre per annum has hitherto been only 83 solid cubic feet. If Mr. Chester's figure of 54 is correct, in spite of the hilly nature of the ground and the steepness of the slopes, then a period of 54 years ought to be very much more than ample to enable a young crop to get out of danger from cattle; while if he is right about so long a period as 54 years being barely sufficient for this purpose, then an average annual yield per acre of 54 solid cubic feet seems too high. This figure Mr Chester has arrived at by generalising from a survey of 16 per cent. of the total area. If the stock is more or less regular, or uniformly irregular, this percentage ought to suffice to give fairly representative figures for the entire forest; but we have no guarantee in the statistical part of the Working Plan of such regularity or uniformity, and recent experience in the North-Western Provinces and Oudh, even in the case of sal forests, tends to throw very great discredit on the results of partial enumeration surveys.

It appears to me that if the annual production attains to so much as 54 cubic feet per acre, it cannot take so long as 54 years for the forest to grow sufficiently to get out of danger from cattle. F. B.

6. But even if we admit the adequacy of the enumeration surveys made by Mr. Chester, it is impossible to accept his estimate of volume, which is based on the average contents of only "two or three" type trees representing each "species-class." If each species-class had been divided into several diameter-classes, even then the measurement of only two or three type trees of each diameter-class would have given untrustworthy results. Indeed, in the extremely regular forests of Germany, where each species is divided into numerous size-classes, based on the double element of diameter and height, no one would think of trusting to results obtained from the measurement of two or three trees in each class. Here, in the Darjeeling forests, the stock in any one place consists, as Mr. Chester himself says, of "all classes of trees, from the sapling to the over-mature oaks and chestnuts, frequently hollow, of over twenty feet in circumference." And yet, in order to estimate the quantity of the standing material, he in several cases lumps up into a single class several species and attempts to estimate their contents by felling and measuring not more than two or three trees belonging to each such class. Even if we admit, for the sake of argument, that the various species included in one and the same species-class possess one and the same rate and form of development under identical conditions of soil, moisture, temperature, and light, it must be acknowledged that the determination of the diameter of the type tree of a class, the diameters of the individuals composing which range from 9 to 84 inches, is practically an impossibility. But let us go even so far as to grant the possibility of solving this problem and suppose that this diameter has been found: we are confronted by yet another insuperable difficulty. Out of the thousands of trees of this diameter but of very various heights and forms of development, which two or three are we to select that represent so exactly the average of these different heights and forms of development that their contents may be generalised for the entire comprehensive species-class? In his paragraph 20, Mr. Chester admits that the demand on these forests is equal to their productive capacity; he ought accordingly to have adopted the most correct procedure possible under the circumstances for estimating the yield, instead of which he employs one that would hardly suffice for a forest of which only a very small fraction of the yield was utilisable.

I fully concur in this. The data on which the estimate of volume has been made are, in my opinion, very insufficient. F. B.

7. I have shown that, so far as the data actually given in the Working Plan are concerned, we know nothing regarding the rate of growth of the trees which mainly compose the stock, or regarding their habit and requirements at different ages; that we are presented with so summary and general a description of the stock that no permanent plan of exploitation can be based thereon; that we are in complete ignorance of the present or potential capability of the forest; and that, as respects the important question of grazing, the facts before us are insufficient to enable us to criticise the proposals made for regulating it. Nevertheless, Mr. Chester has drawn up (see pages 16 and 17) a detailed scheme prescribing the years of all the principal and intermediate fellings for 205 years from 1888-89 to 2092-93. During the entire course of this long period he suggests no revision at all of this plan. Even in Germany, where the forests and the component species have been

It is certain that these proposals cannot be adhered to. Details cannot be laid down for more than 10 years. F. B.

thoroughly studied for centuries, and accurate tables of growth have been compiled, no Working Plan ever provides in detail for 200 years at a time, and numerous periodical checks have to be made during the course of a century.

8 Mr Chester's procedure, which is a modified expansion of the general lines of work sketched out in Mr. Home's No. 44D.F.M., dated 28th April last, and approved in gross in Mr. Ribbentrop's letter No. 339, dated 18th May last, is as follows. He divides the whole area into two working circles, and each working circle into 18 sub-divisions, which, although they differ in size, are supposed to be as equal in productive capacity at it was possible to make them. How far they are really so is entirely problematical. for the very insufficient and inaccurate survey of the stock made is no guarantee of the correctness of the division. Each sub-division is to be worked for three consecutive years, during each of which one-sixth of four-fifths of the standing stock will be removed This first felling will more or less uncover advanced growth and open out the forest elsewhere in order to provoke new reproduction. After an interval of 10 years a second or final regeneration felling will be made, which also will spread over three consecutive years, and in which only the following will be spared: (i) all stems under 9 inches in diameter, (ii) large, well-grown timber trees likely to live for a further term of from 20 to 50 years to the extent of three on an average per acre. These latter will constitute, Mr. Chester believes, one-fifth of the standing stock composed of all stems at least 9 inches in diameter. In order to secure the presence, in sufficient numbers, of oak, magnolia, and chestnut, seedlings at least two years old of these species will have to be planted out at the time of the first regeneration felling to the number of 50 per acre wherever natural seedlings of the same species do not exist to the extent of an average of 20 to the acre. Four years after the final regeneration felling a cleaning (*nettoiement, ausjatung*) will be made either in a single year or in three consecutive years. Additional cleanings may be made, if necessary Six years after the first cleaning, a thinning will take place, followed by two more similar thinnings at intervals of nine years, and by two other very light ones (Mr. Chester wrongly calls these jardinage fellings) at intervals of twenty-three years. No further fellings must then take place for 23 years, *i.e.*, until the first year of the next rotation. Every sub-division to be closed to grazing for 54 consecutive years, beginning with the twelfth year preceding the first regeneration felling and ending with the forty-second year following the final regeneration felling. Only the yield of the regeneration fellings is to be taken into account in the Working Plan, and this yield is to be calculated for three years at a time just before a sub-division is taken up to be worked, so that the resources of each sub-division are to be valued only just before it comes under exploitation.

Not an easy matter to count the seedlings; and to know their number would not be very useful unless it be also known that they are properly distributed.
F. B.

Every third year the yield of a sub-division has to be calculated.
F. B.

Considered in a general manner, the above procedure seems unobjectionable, and, as far as the object sought thereby is concerned, excellent. To this extent it was provisionally approved by Mr. Ribbentrop, but the way in which it is applied is surely faulty. The intervals between the various fellings and the number of the thinnings are laid down with a precision which is not justified by the very meagre details embodied in the statistical part of the Working Plan, or by the almost total ignorance of the capability of the forest, which is to be ascertained separately for each three-year sub-division only as it comes under working. The entire plan is thus a purely tentative one, and as such should have, in respect of the detailed procedure therein involved, been framed for a limited number of years only, say not exceeding thirty (if so many), with a possible revision, if found necessary, at the end of the first 10 years. But in that case the resources of the entire area assigned to the thirty years ought to have been ascertained and recorded in the statistical chapter, instead of which the Executive Forest Officer, whose duty it is merely to carry out the provisions of Working Plans, is asked to estimate it for one-eighteenth of the area every third year—a principle that could not in any circumstances be upheld

Certainly not justified.
F. B.

I agree.
F. B.

9. There are several other points, either of minor importance or dependent on those already discussed, to which I would wish to invite attention, but I have, I think, said enough to show why the plan, as it stands, cannot be passed. Before it can be finally considered Chapters I and II need, in my opinion, to be largely amplified, and Chapter III or the Working Plan proper entirely recast. Perhaps the most satisfactory and quickest method of securing the necessary modifications would be discussion with the local officers on the spot.

e.g., in the description of compartments some attempt might have been made to estimate the areas of unproductive soil.
21-10-87. F. B

E. E. FERNANDEZ,

Assistant Inspector-General of Forests and Superintendent of Working Plans.

The 4th October 1889.

Additional Note on MR. CHESTER'S *Working Plan for the Darjeeling Forests.*

SINCE writing my note of 4th October last, I have been able to visit the Darjeeling Forests, and to study on the spot the more important questions connected with Mr. Chester's Working Plan.

In company with Mr. Manson, the Divisional Officer, I examined, in whole or in part, the following 13 out of the total 24 beats:—Rangju, Tiger Hill, Senchal, Dawáipáni, Ranjirún, Gúm, Nai, Pubung-Tunsung, Rishihát, Bálásan, Chunthung and Parmegari. Amongst these I went carefully over what are considered the most heavily grazed, and on that account seriously damaged, portions of the two working circles. The questions of natural reproduction, nature of stock, rapidity of growth, the effects of grazing and lopping and of the previous working on the development and reproduction of the forest, were carefully enquired into and discussed with Mr. Manson. The results of this enquiry and discussion are embodied in the following paragraphs.

2. The most important question of all is grazing, as on it is made by Mr. Chester to hinge the entire machinery of his Working Plan. Grazing is obviously Mr. Chester's *bête noire*, and he ascribes to it, rightly or wrongly, all the ills the forest *has* suffered and *is still* suffering. I am sorry to be obliged to differ *in toto* from him. In doing so I may appear guilty of presumption in daring to question the dictum of that officer, who has worked in these forests during as many years as I have spent days in examining them, and the conditions in which they have developed. My position, which is also that of Mr. Manson, can, however, be easily established.

3. I have seen a variety of forests in all stages of damage from grazing in the Central Provinces, in Central India, in Ajmir, in the Gangetic and Punjab plains, and in the North-West Himalayas. In many of these places as many as three head of horned cattle (including buffaloes) were pastured per acre, and the grass was so clean shaven off the ground that there was scarcely a vestige of it left: even the bushes were browsed down to the crown of the roots. Now, if we compare the actual condition of the Darjeeling forests, we shall find that, except (i) in the immediate vicinity of the graziers' sheds, (ii) in isolated spots more or less bare of forest growth, and (iii) in a few places where cattle trespass is frequent (entirely the fault of the establishment), the traces of grazing are *hardly* or *not at all* visible. I of course speak of the open forest, for more than half the aggregate area has already for many years been closed to grazing. Even in the immediate vicinity of the graziers' sheds, where cattle must stand about a great deal, there is in many places more or less heavy undergrowth within a few yards of the sheds, and in the midst of this undergrowth seedlings of the better species, including even a few of oak, chestnut, and magnolia, are found. Mr. Chester (paragraph 20 of Working Plan) speaks of large clearings made by the squatter graziers. In nearly every case we examined, the clearing was entirely due to previous reckless fellings made by the Department as well as by its predecessors. The stools of the trees cut, and even some of the trunks still lying unutilised because they were not suitable for the sawyer, attest what I say. The trees to be felled were in many, if not most, instances selected and marked by subordinates, and hence the unscientific manner in which the work was done. It naturally suited the purchaser to get all his trees in one spot.

Once the forest was opened out, superincumbent snow on the tree-tops and winds continued the work of destruction; and cattle, which are concentrated in open places during the rains to save them to some extent from leeches, have prevented the appearance and establishment of a new crop. In such wise have most of the present glades and openings in the forest been formed and perpetuated. If the clearings, of which the graziers were guiltless, had not been made for them by other people (and these our own establishment), the few small herds of cattle admitted to graze would not have been concentrated on to them at a season of the year when the ground is soft and sodden and seedlings germinate, but would have dispersed and wandered about over the large area over which they may roam, and the damage they would have done would have been so lightly distributed as to be scarcely noticeable In only five cases (three in Senchal, which is excluded from Mr. Chester's plan, one in Balasan, and one in Chattakpur) do the herds exceed 20 head, the average number being only 10 (maximum 33, minimum 2) The present grazing rules are indeed so reasonable and give so much control to the forest officer that they in no way interfere with forest conservancy, if this is properly carried out.

4. By what I have said above I do not mean to imply that grazing in former times, before the advent of the Forest Department, was not heavy enough to be destructive; but if the destructiveness was real and great, all traces of it have already practically disappeared except in the three classes of localities specified in paragraph 3, where it is perpetuated, but in a comparatively mild manner, by the present grazing, and will soon disappear with the disappearance of the cattle, when the time for closing comes round in due course. And the aggregate area of such localities is only a very small proportion of the total area of the forests.

After what precedes, it is needless to add that such a thing as "the soil suffering" from the effects of grazing is nowhere visible.

5. Then, again, Mr. Chester does not attach its due weight to aspect, a most important factor of growth in these high hills, which determines to a very great extent the facility or difficulty of reproduction, the favourable or unfavourable growth and the recuperative power of the young forest, and the density of the standing stock. *Cæteris paribus*, the forest on northerly and easterly slopes will be better than that on southerly and westerly declivities. Indeed, the difference between the character of northerly and easterly aspects on the one hand and of southerly and westerly aspects on the other, is so great that the Surail beat, although close to grazing, is, solely on account of its southerly outlook, badly stocked, and in the Rangbul and Thunsung-Pubung closed beats the conditions of vegetation are for the same reason very trying; while amongst the open beats, Parmegari, Chunthung, Tiger Hill, Rangbi, and Nai

contain, thanks to a northerly or easterly aspect, good forest. To intensify the effect of aspect it unfortunately happens that nearly all the southerly slopes are open to grazing, and have been most heavily worked in the unscientific manner already described.

6. I have now proved that grazing, to the extent it is allowed by the rules in force (Appendices 1 and 2 of Mr. Chester's Working Plan), is nothing to be afraid of, and I will show lower down how it can be easily provided consistently with the strictest conservancy of the forest.

7. The next question, which is connected with that of grazing, is that of lopping for fodder. Mr. Chester ascribes also to lopping by the graziers an importance it does not at all possess. He apparently attributes the scragginess and topsoreness of the crowns of the trees to this lopping, whereas it is obvious, from the very appearance of the trees, that snow, assisted by wind, is responsible for the defect in question, which is met with principally where the leaf-canopy has been destroyed and the trees have been completely isolated. If the graziers used the leaves of oak, chestnut, &c., for cattle fodder, it would not be the large trees almost impossible to climb, that they would go to, but to the saplings and poles, which they would never allow to grow up into tall trees, but always keep in the condition of pollards (as witness the open oak forests round Ranikhet); but such a state of things is nowhere visible in the Darjeeling forests. And indeed if the men lopped for fodder any but the five species, Dudila (an arboreous fig), Brassaiopsis (two species of otherwise useless small trees), and Kibu (a Strobilanthes?) and *Rubus lineatus** (both the last mere shrubs), and also bamboos and climbers, they could be punished by having the number of their cattle reduced to only those they may graze throughout the year, besides incurring any other penalty under the Forest Act or Penal Code. Actually they cut without hindrance also another almost herbaceous acanthaceous shrub, much smaller than the Kibu. Leaf fodder is cut principally for the yearling calves, which are not allowed to leave the *bathans*, and which are not counted separately from their mothers. The requisite amount of leaves is easily obtained from the few species the graziers are allowed to cut, the removal or keeping down of which species is often beneficial to the growth of the more valuable ones. Lopping for fodder to the extent it is permitted and is actually practised in the Darjeeling forests does no damage whatsoever, and many more unimportant species, such as Lali, &c., may also, without harm and sometimes with benefit to the forest, be permitted to be cut

* A raspberry.

8. In connection with the subject of lopping I must here point out the mistake made in the grazing rules, which imply that there is only one species of Brassaiopsis in the Darjeeling forests, and that that species is *B. Hamla*, a species which, according to Gamble, grows much below the lowest point of these forests.

9. Another error made by Mr. Chester must also be referred to, as it is connected with his estimate of the possibility. He throughout his descriptions and plan calls Brassaiopsis "*Chindia*," and in his enumeration survey counted Chindia with Dudila, both of which he excluded from his estimate of the yield. Now, it so happens that Chindia is the common name for several species of Heptapleurum, and actually the enumeration survey recorders counted these species, not Brassaiopsis, with Dudila. Brassaiopsis is *dung dung* in the Paharia dialect and *phota* in Bhutia. The error Mr. Chester has fallen into is probably due to the resemblance, in respect of leaves and habit, between the Heptapleurum and Brassaiopsis. I should not be surprised if all the Heptapleurum and Brassaiopsis were included by him under "Chindia," as the enumeration survey recorder employed by him called them all Chindia before me, until, after my examination and enquiry, he was convinced that the two species of Heptapleurum were quite distinct from the two species of Brassaiopsis. I may say here that I was informed by every one conversant with the matter that the leaves of Heptapleurum are not eaten by cattle.

10. The old stock is everywhere in a more or less ruined condition from unscientific felling; but wherever the forest has been closed for a few years to grazing, or the aspect is favourable, and the previous felling has not been an uncompromising clearing, there the reproduction is complete and fully established, and the remains of the old stock, would be removed with advantage to the young crop now coming on. The ease and profuseness with which kharani (*Symplocos lucida*) springs up and the rapidity with which it grows up are marvellous, and, wherever the aspect and elevation are suitable for that species, render the regeneration of the forest a very simple matter. The seedlings are produced and grow up under heavy shade, and under the shelter they afford, young oak, chestnut and magnolia, which are seldom met with in the open, come up in sufficient abundance. Where kharani is not plentiful, its place is taken by species of the laurel family—particularly Machilus and Daphnidium—and maples, which last are numerous everywhere. Small shrubs and undershrubs (notable among them being bamboos, kibu and raspberries) combine very effectively with kharani and the rest to cover and protect the ground and afford the shelter necessary for the reproduction of the valuable species of trees.

11. I have already said that the old or upper crop is open. Here I must say more specifically that it is everywhere open enough not to require either a preparatory regeneration felling or a seed felling. All that is necessary is to make secondary regeneration fellings over sufficiently complete and established advance growth. There is no objection to execute these secondary fellings in two successive operations as proposed by Mr. Chester, but where, in my opinion, that officer makes a mistake is to prescribe the fellings in question in localities which are not yet in a condition to bear them. For instance, the areas to be felled in the Western Circle during the first six years are such as contain very little advance growth, and some

amongst them are the most heavily grazed portions of that circle. It would be a fatal error to remove thence nearly half the old crop before reproduction was assured. What is really wanted in such places is rest and closure against grazing for a few years until the desired reproduction was secured, and then, and only then, execution of the secondary regeneration fellings. The mistaken procedure recommended by Mr. Chester is merely a perpetuation of the vicious system now followed, which he himself, although as Divisional Officer the remedy was in his own hands, strongly condemns (see last sentence of detailed description of Balasan 1 and 3, and penultimate sentence of that of Balasan 2). Mr. Manson and I examined Balasan 1, 2, and 3, and we were both unanimous as to the undesirability of working these compartments in their present condition.

12. The treatment and work prescribed by Mr. Chester should accordingly be modified in the following directions:—

(*a*) The detailed procedure should be laid down for only ten years. Our present very imperfect knowledge of the forests and their component elements preclude any farther looking ahead.

(*b*) The compartments to be worked by means of secondary regeneration fellings should be those in which advance growth is most abundant and most completely established, and therefore, not only requires, but can bear, immediate uncovering.

(*c*) These compartments should be closed during the entire period of ten years.

(*d*) During the same period the following compartments should also be kept closed to grazing :—(i) Those whose turn of working will follow immediately that of the compartments assigned to the first decade ; (ii) those which have suffered most from reckless cutting, from grazing, and from fire ; (iii) those which contain sowings and plantations that give promise of success ; and (iv) others to bring up the aggregate closed area to half the total area of the forests. The areas kept open to grazing will be such as are likely to suffer least from the exercise of the concession.

(*e*) The Executive Officer should be directed not to omit carrying out fostering operations among the young growth simultaneously with the execution of the secondary regeneration fellings.

To the above I would add the utilisation of the enormous quantity of dead and fallen wood, which is allowed to deteriorate and even rot under the present system of working. For this purpose I would divide each working circle into ten more or less equal portions and clear out each portion during the year of the decade assigned to it. I would banish for the present all ideas of thinnings, and would recommend leaving cleaning operations to the discretion of the Executive Officer, as he will be the best judge of their necessity, timeliness, and nature in each case.

13. Regarding the rapidity of growth, I am fully convinced, now that I have seen the forest, that an annual yield of 54 solid cubic feet per acre is too low a figure. The soil is nearly everywhere excellent, the climate is damp and forcing, and the species so well adapted to their surroundings that, even if the rate of growth of each individual tree is not rapid, the growth is dense enough to give a large annual increment per acre. But the individual trees themselves grow up rapidly, if any conclusions can be drawn from the measurements made by me of the planted oaks and magnolias ; and the results to be observed in the progress of the young crop in the Rangirún beat would be striking, even in many a sal forest of North-West India. I should feel inclined to estimate the mean annual increment at a figure nearer 80 than 54 cubic feet.

14. Thus the yield will be larger than that expected in the Working Plan and the apprehensions of a wood famine in the stations of Darjeeling and Jalapahar have no real basis But the Working Plan completely ignores the requirements of the Darjeeling planters, whose interests are at least as important as those of the casual visitors, who mainly compose the population of the station of Darjeeling. A complaint has already been received from one of the planters in connection with this Working Plan. I am aware that in this office we have to criticise only the technical details of the Working Plans sent up for approval, and that Government, as owner of a forest, may do what it likes with the produce thereof. But if we can show how wants hitherto not provided for can be met by a slight modification of a Working Plan, it is clearly our duty to do so.

With an annual acre-yield of 80 cubic feet, the forests prescribed for in Mr. Chester's Working Plan will yield more than the requirements of the two stations of Darjeeling and Jalapahar, especially as coal, at Re. 1 a maund, is now beginning to be used for warming purposes. The balance of material can be still further increased by bringing under the Working Plan the more distant forests and exploiting them and the more remote portions of the present area principally for charcoal, which can stand much longer carriage than firewood. Perhaps, if my plan to meet the requirements of the planters is approved, it may be found necessary to reconstruct the working circles with a view to the convenience of supply.

15. In conclusion, I have to invite attention to the absence of anything like a sufficiency of export lines, to which is due the non-utilization of so much dead and fallen material left to decay in the forest. The only mode of transport employed on a large scale is carriage in ordinary bullock carts, which requires extremely expensive roads, and is the reason why the forests are still, after nine years' working, so inaccessible for the exporter of forest produce. Unusual facilities exist for the construction and employment of sledge-ways, and

the Divisional Officer would with advantage be sent to visit the export works near Chakrata and on the Tons in the School Circle of the North-Western Provinces and Oudh.

E. E. FERNANDEZ,
Assistant Inspector-General of Forests and Superintendent of Working Plans.

The 28th November 1887.

No. 766—125For.

COPY, with copy of enclosures, forwarded to the Conservator of Forests, Bengal, for the favour of early report, in continuation of Mr. Macpherson's endorsement No. 120—29Forests, dated 13th January 1888.

By order of the Lieutenant-Governor of Bengal,

H. W. C. CARNDUFF,
Under-Secy. to the Govt. of Bengal.

CALCUTTA;
REVENUE DEPT.—*Forests,*
The 5th March 1888.

No. 3771—604For., dated Calcutta, the 15th October 1889.

From—H W. C. CARNDUFF, Esq., Under-Secy. to the Govt. of Bengal, Revenue Department,
To—The Conservator of Forests, Bengal.

I AM directed to invite your attention to my endorsement No. 766—125For., dated the 5th March 1888, and subsequent reminders, and to enquire when the report therein called for regarding the proposed Working Plan of the Forests near Darjeeling may be expected by Government.

No. 193DF—G, dated Darjeeling, the 28th October 1889.

From—A. L. HOME, Esq., Conservator of Forests, Bengal,
To—The Secretary to the Government of Bengal, Revenue Department (Forests).

WITH reference to the correspondence resting with your letter No. 3771—604For., dated 15th instant, I have the honour to submit a copy of a letter, No. 51C of that date, from the Deputy Conservator of Forests, Working Plans Division, containing his report and proposals for the preparation of a Working Plan of the Forests near Darjeeling, setting forth the main principles on which it is proposed that it will be based, which will, I trust, meet with the approval of His Honour the Lieutenant-Governor, when it will be submitted for the consideration of the Inspector-General of Forests to the Government of India.

2. No change has been made up to date in the location of graziers in the reserved forests for the supply of milk, &c., to the stations of Jalapahar and Darjeeling. This question will be settled by the Deputy Conservator in consultation with the Deputy Commissioner of Darjeeling.

No. 51C, dated Darjeeling, the 15th—17th October 1889.

From—F. B. MANSON, Esq., Deputy Conservator of Forests, Working Plans Division,
To—The Conservator of Forests, Bengal.

IN compliance with your request, I have the honour to submit the following report giving an outline of the plain I propose for working the Darjeeling forests. I append also a précis of the criticisms passed on Mr. Chester's draft Working Plan.

2. The four chapters into which Mr. Chester's plan is divided will be revised.

3. The capability will be based on area. Considering the generally deteriorating character of the growing stock, composed in great part of over-mature and unsound trees, I do not think it would serve any useful purpose to attempt at present to calculate the capability in volume. The Inspector-General and Mr. Fernandez concur in the opinion that there is sufficient material for a station twice the size of Darjeeling and Jalapahar, and ample for planters also. As far as fuel is concerned, I agree in this view, and consider that the most,

important point is to check waste and utilize the deteriorating material before it becomes utterly worthless.

4. With this object several working circles will be formed, so that the material may be economically supplied to the various centres of demand, and that the amelioration fellings may not be too long delayed in any part of the forest.

5. The regulation of fellings will be for ten years only, after which there will be a revision of the Working Plan; but in some respects, *e.g.*, the closing of compartments against grazing, two decades will be considered.

6. Generally speaking, each working circle may be considered as comprising two zones: the lower, nearer to the tea estates, will probably supply these, or otherwise may be worked principally for charcoal making; the upper zone, which is generally better provided with export lines, will be worked for the supply of Darjeeling, Jalapahar and the general public. Such an arrangement is not absolute, and the future development of communications may alter matters; but at present it appears to be the most economical. The local officers will decide, year by year, from what working circles the supply of Darjeeling and Jalapahar may most conveniently be drawn.

7. Charcoal may possibly be brought from more distant forests, even beyond the working circles.

8. In each working circle (excepting those areas worked previous to 1887) there will probably be regeneration fellings destined to yield the principal produce, at any rate as regards scantling timber, and to effect the gradual transformation of the forest or working circle into one of separate age-classes. At the same time amelioration fellings will traverse the remaining portion of the working circle during the decade with the view of utilizing deteriorating wood and species it is not desired to reproduce, as suggested in Mr. Ribbentrop's note, dated 11th December 1888. Such amelioration fellings will be conducted so as to prepare the compartment for its regeneration, bearing in mind the period when this will probably come about.

9. The regulation of grazing will of course be in accordance with the grazing rules, which appear to me to give the Forest Officer all the control necessary. It will probably be quite sufficient to restrict grazing, as at present, to about half of the entire forest. Sufficiently long notice must be given to graziers of intended changes to enable them to construct new *bathans;* and the areas kept open must not give less than 5 acres per head of cattle, suitable for pasture. If there is any ground to anticipate unreasoning opposition on the part of the graziers to any change that is absolutely necessary, I have no doubt that, on the matter being put clearly before the Deputy Commissioner, the necessary arrangements can be brought about without difficulty, and so as to cause no inconvenience to the public.

10. Work is going on in the Rangirún and Nai blocks compatibly with the above general proposals, and I hope during the cold weather to be able to submit a comprehensive Working Plan for all the forests of the Darjeeling sub-division, excepting the Singalila Range, and including the Dhobijhora forest of the Kurseong sub-division.

No. 232, dated Simla, the 14th April 1890.

From—H. C. Hill, Esq., Offg. Inspector-General of Forests to the Govt. of India,
To—The Secretary to the Government of Bengal, Revenue (Forests) Department.

I have the honour to acknowledge the receipt of Mr. Monahan's letter No. 4210—686, dated the 4th December last, forwarding, for my opinion, an outline of the revised proposals for the working of the Darjeeling forests, submitted by the Conservator of Forests, Bengal.

2. In reply, I beg to forward, for the information of His Honour the Lieutenant-Governor, a copy of a letter on the subject which, as the matter is a purely technical one, I have addressed the Conservator direct.

No. 231, dated 14th April 1890.

No. 231, dated Simla, the 14th April 1890.

From—H. C. Hill, Esq., Offg. Inspector-General of Forests to the Govt. of India,
To—The Conservator of Forests, Bengal.

I have the honour to offer the following remarks on the subject of the preparation of a Working Plan for the Darjeeling Forests, regarding which you have submitted certain proposals in your letter No. 193DF—G, dated 28th October last, to the address of the Secretary to the Government of Bengal, a copy of which has been forwarded to me by that Government for opinion.

2. It is proposed to treat the forests eventually by the method—known as the *uniform method*—of successive regeneration fellings and thinnings, and for this purpose to subject such portions of the crop as are not fit for the immediate application of the method to conversion fellings. There would be thus two separate series of fellings, namely, improvement or conversion fellings, and regeneration fellings. The improvement fellings would be made by area and carried on simultaneously in different parts of the forests during a provisional rotation until such time as the whole forest was ripe for treatment by the uniform method.

3. The uniform method is, I need hardly say, an elaborate one, requiring a considerable amount of skill and constant supervision on the part of the staff charged with its application; while the method of treatment by selection fellings is simple, and requires less skill and supervision on the part of the forest staff. This method is, moreover, particularly adapted to the Darjeeling forests, which are situated on mountainous ground and at a high elevation where reproduction is slow and difficult. No other system of working lends itself so well to such conditions; while the uniform method could not, in my opinion, be safely applied,—at any rate to the portions of the forests of highest elevation. The uniform method might be applied without risk to the forests of the lowest zone, but the demand from these being chiefly for fuel, the method of coppice, or of coppice with standards, could probably be more advantageously adopted for these areas. It may perhaps be considered whether, if some of the lowest forests are treated under coppice, an intermediary zone between these and the highest forests should be subjected to the regular method, or the whole of the remaining area treated by selection fellings.

4. I am supported in these views by both Dr. Brandis and Dr. Schlich. The former, in paragraph 42 of his "Suggestions," states that a great portion of the forest area available for the supply of the station of Darjeeling "lies at an elevation greater than 7,500 feet, where, in this district, natural reproduction is exceedingly slow and uncertain, and where probably only very cautious selection fellings can be made." The latter, in his memorandum on the Darjeeling forests, states (paragraph 10) that only unsound or decaying trees should be removed from the forests above the cart-road, while in the forests below the roads heavy fellings might be made and coppice treatment adopted for the lowest forests.

"Suggestions regarding the management of the Forests in the Julpaiguri and Darjeeling districts, Bengal:" 1880.

"Memorandum on the management of the Forests in the Darjeeling Division, Bengal:" 1882.

5. I recommend, therefore, that the forests be considered as occupying three distinct zones, according to their elevation, and that those of the highest zone be treated by the selection method, and those of the lowest, or a portion of them, subjected to fellings for coppice with or without standards. It must be left to you, in consultation with the Working Plans Officer, to decide whether the remaining intermediate zone can be best treated by the uniform method or by selection fellings.

6. The forests should be divided into as many *working circles* as the composition of the crops, the markets supplied, and other conditions may require. It is not necessary, if there are several working circles, that the areas to be gone over each year should yield at present equal quantities of material. The plan will be more permanent if they are made, where coppice or selection fellings are adopted, as equal in area as natural limits admit of. The length of the rotation of the fellings, in the portions worked by the method of selection fellings, should be determined with reference to the state of the crop and the need for immediately removing over-mature trees, &c., and it should be an integral portion of the length of the true rotation or the age of trees of exploitable dimensions. A long interval renders it possible to remove a larger quantity of material at each passage of the fellings, but, if very long, it will probably be necessary to provide for the separate removal of the dead and windfallen trees; while with a short interval this can be avoided. These points should be fully considered in fixing the interval between the successive fellings in the same area. Where possible, the capability of each circle should be determined by volume; but where, owing to the irregular condition of the forest, this is not possible, the number of trees felled should be limited by cultural rules, such, for instance, as restricting the fellings to dead, dying or irretrievably injured trees; and an estimate of the outturn, based on an enumeration of the trees to be removed, should be made. The selection fellings would thus, where the crop required this treatment, partake of the nature of improvement fellings. These fellings would be indicated in detail in the last column of the "Description of Compartments," which should contain such remarks as were necessary regarding the future treatment required in each compartment or sub-compartment.

7. I am aware that the above suggestions are not altogether in accordance with the opinions given by Mr. Ribbentrop in previous correspondence. But his opinion, that the selection method was inapplicable because the forests could not be closed against grazing was based on the statements contained in Mr. Chester's proposed Working Plan of 1887 as to the great injury done to the forests by grazing. It appears, however, that this injury was very much exaggerated, and that, under the restrictions enforced by the grazing rules, the damage done by the limited number of cattle allowed to graze in the forests is not sufficient to hinder reproduction. My recommendation in favour of selection fellings is in accordance with Mr. Ribbentrop's views as to the necessity for a simple and easily-applied scheme of organization and treatment.

8. The grazing should be regulated by the closing, for such time as may be deemed necessary, of the areas which most require rest and of the coppice areas. This should present no difficulty, as, in order to provide the grazing that is required for the milch cattle of Darjeeling, it will only be necessary to leave open from 3,000 to 6,000 acres of conveniently situated forest.

9. It is stated in paragraph 4 of Mr. Chester's proposed Working Plan that there are other forest areas belonging to the Darjeeling Forest sub-division which, being situated at too great a distance from Darjeeling for easy working, have been omitted from that plan. I am of opinion that the area embraced by a working plan report should include all the forests in an administrative charge and the entire area of each such forest. The area so included might comprise a range or a sub-division, or merely a beat or group of beats,

according to the requirements of each case, and should be divided into as many working circles as were required, areas which it was not expedient to work being relegated to a separate circle, or to several separate circles if necessary, with suitable prescriptions for their protection or improvement.

10. In conclusion, I would suggest that, as far as practicable, the subjects treated in the Working Plan should be arranged in the order shown in the Appendix to this letter. The arrangement adopted in the previous plan was defective and should not be followed.

APPENDIX.

Memorandum indicating the arrangement and order in which working plans should be drawn up.

A working plan report should contain (1) a summary of the facts on which the proposals are based, (2) a discussion of the whole body of these facts with a view to the elaboration, in logical sequence, of the proposed plan of working, (3) the working plan proper or the rules which it is proposed to prescribe. It should also include an introduction containing a statement of the establishment employed on the preparation of the plan, the length of time devoted to the work, its cost, and any other matters of importance which do not find a place in the body of the report.

A SUMMARY OF THE FACTS ON WHICH THE PROPOSALS ARE BASED.

Description of the Tract to which the Report relates.

Name and situation of the forest area (Civil District and Forest Division).

General configuration of country and surroundings of the forest (flat or hilly or plateau).

Soil (special facts affecting forest growth).

Climate (temperature; rain; frosts: their effects on forest growth)

Legal position of the forests (number and date of Gazette Notification; under what section of Act; brief history of acquisition by Government). Nature of the *rights, &c.*

Area of the forest (with such detail as is possible). Areas of enclosures, blanks, &c.; maps from which areas are taken, and their degree of accuracy.

Boundaries (not a register of boundary marks, but a statement of the kinds of marks used, their state of repair, adequacy, whether the boundaries are of themselves good or require revision; properties, &c., bordering on the forests, and necessity for protecting forests from encroachment, &c.).

Roads (their state of repair, purposes for which used, adequacy, &c.).

Buildings (state of repair, adequacy for purposes for which required, &c.)

Rivers (size, importance, &c.).

Private lands (if any) included in the forest (size, importance, how demarcated, &c.).

Miscellaneous facts relating to the description of the tract—

Nature and condition of the Forest Growth—

A broad general description of the character of the growing stock in the forest considered as a whole (with such details as it may be necessary or possible to give with regard to the principal species composing it, their relative proportion, density of the crop, their reproduction, exploitable size, rates of growth, and so forth; nurseries, if any, in the forest; plantations made in the past; the blanks and glades and best means of reducing their size, &c., &c.).

Protection and maintenance of the forest—

Brief history of past management of the forest (as regards its maintenance).

The effect of the rights and enclosures on the forest management.

Causes of injury to the forest (forest offences, fires, grazing, &c., &c.).

The Protective Staff (number, cost, adequacy, &c).

Expenditure (cost of works of protection, maintenance and improvement of the forest in past years).

Yield and Working—

System of working in force (with an account of changes introduced in former systems, with their object and result).

Products yielded [(*a*) timber, (*b*) fuel, (*c*) other products]. *Quantities of these products* yielded annually in past years, and value of these products (average annual revenue in past years).

Markets for the products and requirements to be met for right-holders, &c., &c. Distance, importance, size, cost of transport, prices realized for the produce at these markets.

Discussion of proposals for working.

In view *of the whole body of facts* of which a summary is given above, the proposals for working should be discussed in the order following :—

Exploitability and system of working which it is advisable to adopt, with reasons for this.

Division of the forest into working circles, and reasons for this division.

Method of treatment to be applied to each circle. Detailed description (in tabular form) of the compartments included in each circle. How formed.

Calculation of the Rotation.—Periods into which divided, or, in the case of selection worked areas, periods between successive fellings, for each circle separately.

Calculation of the annual yield or, in the case of area fellings, of the area to be felled annually, with estimated outturn for each circle. Where an enumeration or estimate of the growing stock has been made, the method followed should be described.

Method of conducting the fellings (for each circle, with reasons for this).

Special works of improvement (for works special to each circle and those affecting the whole area separately; roads, buildings, plantations, regulation of grazing, fires, &c., &c., &c.).

Forecast of financial results (compared with results obtained in past years).

WORKING PLAN.

This portion should contain, without any discussion whatsoever, the actual prescriptions of the Working Plan in the order stated above, viz.—

For the whole area—

Object sought to be attained.
Year from which it is proposed the plan should come into force, and time it is to remain in force.
Working Circles into which the whole area is divided.

Then for each Circle separately—

Method of treatment.
Rotation, or age of exploitability; interval between successive selection fellings.
Number of trees, volume of wood, or area to be felled annually.
Order of felling (in the form of a tabular statement).
Method of conducting the fellings.
Special works of improvement affecting the Circle only.

And then for whole area again—

Special works of improvement which refer to the whole area, regulation of grazing, of fires, roads, buildings, &c.
General remarks.

No. 1835—266For., dated Calcutta, the 16th May 1890.

From—W. MAUDE, Esq., Under-Secy. to the Govt. of Bengal, Revenue Dept.,
To—The Conservator of Forests, Bengal.

WITH reference to letter No. 231, dated the 14th April 1890, from the Inspector-General of Forests to your address, regarding the proposed Working Plan for the Darjeeling Forests, copy of which has been forwarded to this Government, I am directed to invite your attention to the observation made in paragraph 8 of the letter, that from 3,000 to 6,000 acres will only be necessary for the milch cattle of Darjeeling. The basis on which this conclusion has been formed is not understood, and I am to request that the estimate of grazing requirements should be made in communication with the Deputy Commissioner of Darjeeling.

No. 93DF—G, dated Darjeeling, the 20th June 1890.

Memo. by—A. L. HOME, Esq., Conservator of Forests, Bengal.

COPY of the following forwarded to the Secretary to the Government of Bengal, Revenue Department (Forests), for information, with reference to his No. $\frac{1835}{266}$ For., dated 16th ultimo, the orders contained in which regarding the grazing question will be carefully attended to.

No. 87DF—M, dated Darjeeling, the 20th June 1890.

From—A. L. HOME, Esq., Conservator of Forests, Bengal,
To—The Inspector-General of Forests to the Government of India, Simla.

I HAVE the honour to acknowledge the receipt of your letter No. 231, dated 14th April 1890, in which you have recorded your remarks on the proposals submitted in my letter No. 193DF G, dated 28th October 1889, concerning the preparation of a Working Plan for the Darjeeling Forests, and would request the favour of your sanction to the following modifications of the lines therein laid down as those on which the plan should be drafted in certain cases, for the reasons given, after consulting the Deputy Conservator of Forests, Working Plans Division.

2. *Paragraph 2 of your letter.*—The result of further detailed inspection of the forests has shown that the area characterized by very steep slopes, poor soil or bare rock, exposed situation, and generally the tops of hill ranges of highest elevation, is considerably greater than was anticipated when the proposals of October last were drawn up. All such areas should certainly be worked by selection fellings.

As regards the rest of the forests to be dealt with in the plan, however, we consider that they should be worked with the view to their being eventually converted to the uniform method ; this will doubtless be a very gradual proceeding, and conversion fellings, having the character of modified selection fellings, would have to be resorted to during the first rotation with the object of transforming the forest into one of separate age classes. This system was approved by Mr. Ribbentrop after he had visited the forests. He clearly recognizes the insufficiency of pure selection fellings or *jardinage* to maintain a supply of *timber*, and we are of opinion that it should be followed in the areas of the forests other than those above specified.

3. The general treatment of the forests by selection fellings has serious drawbacks, amongst which the following would be most felt :—

(1) The produce has to be gleaned here and there over comparatively large areas, whereas for the fuel-supply of Darjeeling at least it is desirable to concentrate the fellings. This is particularly the case where charcoal has to be made, as there is naturally great difficulty and expense in collecting wood from a distance to make a kiln. The rolling or gliding of wood down the hill sides does much damage in any case, and would be the more serious in a forest worked by selection fellings, where all age classes are mingled on the same area.

(2) The above objections refer primarily to departmental operations, but apply also to removal by purchasers. The greater cost of collection would undoubtedly prejudice the sales.

(3) Control is more difficult owing to the greater area over which working extends, and it is practically impossible to keep a correct account of the stock of the forest or to realize whether it is being impoverished.

(4) The grazing question would present fewer difficulties, and would be easier of control on a rotation with less permanent damage to the forests under the uniform method.

(5) In the present state of the forests, which contain large quantities of over-mature and damaged material, their treatment by selection fellings would not ordinarily result in the maintenance of a supply of timber fit for sawing.

(6) The damage done to surrounding trees by the fall of those selected for felling is often very serious; it would, we consider, be less under the uniform method.

4. To ensure the proper execution of selection fellings constant supervision would certainly be necessary, as also a knowledge of sylviculture, more particularly in view of the difficulty there is in determining the capability of these forests, which makes it all the more incumbent on us to be careful not to impoverish them. We consider that there is a greater chance of neglect of sylvicultural principles under the system of selection fellings than where fellings are concentrated and can be more effectually controlled by superior officers, as it is less clear what may safely be removed, and errors are not so easily discovered when the areas worked over are scattered and extensive. Ready excuses can always be brought forward for the injudicious selection of trees for felling, and the forest being already irregular it will always be extremely difficult to bring home the fault to the officer responsible for it. It is to be feared that the system of selection fellings, if generally adopted for the entire area of the forest, would degenerate into selection by purchasers, as under the former practically unrestricted "permit" system, whereby we have lost a heavy percentage of the finest trees of valuable species.

5. For the above reasons we are in favour of concentrated fellings, tending towards the uniform method, wherever it is not necessary to treat the forest by selection fellings (see paragraph 2).

6. The regeneration fellings would, as a rule, consist in leaving the best trees of all species, those especially with lofty crowns, principally to give shelter and check the growth of brambles and noxious weeds. They would, where necessary, be supplemented by planting, for the condition of the forest as a whole is so irregular, and the larger trees so seldom form canopy, that natural reproduction alone can, in some cases only, be depended on. The trees reserved for shelter would be felled when the young growth could dispense with the protection they afford, except selected flourishing trees of the best species capable of attaining to a more useful and valuable size. The first felling previous to planting would yield inferior material, chiefly fuel, but the subsequent removal of the shelter trees would yield a quantity of good material fit for sawing; this material would we believe, in average localities, be available in about ten years, but the interval would, of course, depend on the condition of the young growth

7. For the conversion of the forest to which the uniform method is suitable, we do not consider that a provisional rotation would be necessary except in the sense that during the first rotation the age classes must be established by means of amelioration or conversion fellings in those portions of the forest not fit for regeneration during the first period. The duration of the first rotation might easily be made the same as that to be finally adopted.

8. One very decided advantage of regular working tending towards the uniform method is the ease with which grazing can be provided for in the periodic blocks containing trees of middle age, closing that in use and those next in order in which advance growth is not sufficiently established.

9. *Paragraph 3 of your letter.*—As remarked above (paragraph 6) we consider that in the present condition of the forests regeneration must generally be aided by planting; for many years to come therefore (if ever) no elaborate series of regeneration fellings will be necessary. The fellings in the blocks worked (with the view to the conversion of the forest to a state suitable to its adaptation for the introduction of the uniform method of working) by conversion fellings would be modified selection fellings, in executing which the officer would be guided by a consideration of the time to elapse before a given block would be regenerated. Conducted with a definite object in view, these fellings would permit of a certain number of large trees (fit for sawing) being marked in blocks whose term of regeneration is remote, and this is a matter of very great importance in view of the constant and growing demand on these forests for timber.

10. We do not consider that it would be difficult to explain clearly in the plan the treatment needed in each block, and if this system of working is held to be too elaborate and it is desired that the Working Plan shall not be so framed that a knowledge of sylviculture will be essential to its being carried out, we fear that no working plan will be of much use towards practically effecting the improvement of the forest and guarding against its impoverishment.

There is no doubt that an intelligent application of the rules of sylviculture is of far greater importance than the most careful and accurate determination of the annual capability, particularly when numerous working circles are established. The latter is impossible of attainment in the present irregular and, in great part, damaged condition of the growing stock. While fully appreciating the advantages of a simple and easily understood and workable scheme adapted to the capacity of our forest staff, we cannot, in our opinion, rely entirely upon our forest rangers and foresters to carry out the simplest rules for pure selection fellings with less supervision on the part of their superior officers than would be required by the plan now advocated.

11. Steps have already been taken to mark off the forests of highest altitude which must be permanently treated by selection fellings. The forests on the north face of the Goom range in great part occupy very steep slopes, the lowest portions being generally the most precipitous. These must be worked, for some time to come at least, also under the system of selection fellings. Eastern slopes are also frequently steep, as at Dhobijhora, and will in many cases have to be treated by the same method.

12. Scantiness of natural reproduction cannot be applied to these forests generally. Mr. Manson, after his recent inspections, reports:—"On the whole I find seedlings of laurels very common, as much or more so than maples. At the highest elevation too (about 8,000 feet) on the Senchal ridge, I have been particularly struck with the abundance of oak seedlings, saplings and poles, which seem to come up with the feathery maling bamboo, but are not so common under the dense 'kibu' (*strobilanthes pectinatus*). The reproduction of laurels is also abundant on the Senchal ridge as elsewhere." The Senchal ridge is the most exposed part of the forests that will come within the Working Plan.

13. We do not consider that the method of coppice (simple or with standards) is generally suitable for the forests of lowest elevation, As a rule (with the exception of the old Senchal barracks site) such blanks and devasted areas as exist in these forests are situated near the lower edges, and, as recorded by Dr. Brandis, it is in the forests at an elevation of less than 7,000 feet where, if the circumstances are otherwise favourable, reproduction may generally be counted upon. The produce of coppice fellings would not give the class of fuel in demand, and that purchasers have been accustomed to. Tea concerns being situated below the forests draw their supplies chiefly from the lower forests, and the charcoal they prefer for tea manufacture is in large lumps, which will glow and radiate their heat for a long time. Moreover in very many instances the lowest parts of the forests are the most precipitous and therefore least suitable for treatment under coppice. It has also been recognized by all officers that in these forests complete clearances are a mistake, and, as Mr. Brandis states in his report, "the luxurious growth of herbs, brambles and other shrubs," and of "the useless *evodia fraxinifolia*," are a sure consequence of such fellings. At the age at which coppice would be cut (say up to 30 years) the vast majority of the produce would, in these forests, consist of inferior material for which it would be extremely difficult to find a sale. Dr. Schlich was of opinion that areas treated as coppice would have to be planted closely (presumably with the view to excluding inferior species).

14. It is true that in the report submitted in October last it is said that, generally speaking, each working circle may be considered as comprising two zones; but no demarcation between them or difference in method of treatment was advocated; it was only intended to indicate how the material in the forest might be most economically disposed of or apportioned off to meet the demands on the forest, and I trust that you will not require any formal division of the forests below those of the highest elevation to be made in the preparation of the plan. It would be far preferable to leave it to the local officer in charge at the time to determine the limits within which it would be profitable to convert the material into scantling, firewood or charcoal, and whether it might be more profitably carried to the Darjeeling or Jalapahar market, or sold locally to meet the demand of tea gardens, &c.

15. *Paragraph 4 of your letter.*—The cart-road referred to by Dr. Schlich in 1882 was the Goompahar cart-road, which had then been commenced. It is now nearly ten miles in

length and is near the top of the Goom ridge, which it touches at the dips or saddles at Goom neck, Lepchajagat, Sukia Pokri and Gairibash. He also refers particularly to the Rungbi road and, as stated in paragraph 5 of his memorandum, the following paragraphs refer to the blocks included in the Darjeeling and Jalapahar supply circles only. The forests above these roads have already been set aside as those of highest elevation and exposed situation to be treated by selection feelings. The whole of the forest from Jorbungalow to Kurseong is above the hill cart-road (Darjeeling-Himalayan Railway) except the Dooteria block, which had already been worked out and planted up (partially, planting since completed) when Dr. Schlich's memorandum was written.

16. The heavy (clean) fellings allowed by Dr. Schlich were, it is believed, designed to concentrate working and to yield sufficient material in a suitable locality to enable charcoal for the supply of the station of Darjeeling to be made economically and sold in the station at a low rate. It was, however, recognized by Dr. Schlich in paragraph 10 of his memorandum that fellings should not be very heavy, and I find the following notes are recorded on the margin of my office copy.

With reference to the forests above the Goompahar cart-road and the Rangbi road, Mr. Gamble notes—"I would leave even more, as if the ridges are much thinned windfalls get very numerous," and, with reference to the prescription that poles and saplings only should be left,—"I would give a wide margin in the definition of *poles*, and include most sound straight trees, not too big," to which I added, on a fixed limit being asked for by the Divisional Officer "say up to 4′ girth for oak and 3′ for other trees."

It was the practice to aid natural reproduction by planting in the areas worked, and this is now followed where necessary. As regards natural reproduction I find the following note recorded by Mr. Chester, dated October 1882, on paragraph 11 of Dr. Schlich's memorandum:—"I don't think natural reproduction has had a fair trial. Until last May not only was grazing allowed up to the time of cutting, but even during and after."

17. *Paragraph 5 of your letter.*—The forests of the highest elevation have, as already stated, been taken in hand with the view to their being permanently treated by the selection method. For reasons given above, however, it is not advocated that the plan shall lay down any definite division of the remaining forest into zones.

18. *Paragraph 6 of your letter.*—The instructions here given will be attended to As regards the true rotation, or age of trees of exploitable dimensions, in forests worked by the method of selection fellings, it is understood that as the number of species is very great, the measure of exploitability is to be chosen with reference to the most valuable of the prevailing species, viz., the oaks, magnolias, michelias and laurels. Pipli, toon and walnut are not very abundant. It is not easy to arrive at the age of trees growing in a forest treated by selection fellings; the size is in such circumstances the best measure of exploitability.

19. As to determining the capability by volume. The stock is almost everywhere very irregular, the proportion of unsound trees (difficult often to detect until the trees have been felled) is large, though variable; there are many trees without crowns, and much waste material exists both in blocks whence trees have been sold for sawing and in less accessible blocks where over-mature and windfallen trees are common. It appears to us that under these circumstances no reliable or useful results could be obtained in attempting to determine the volume capability, and that for the next twenty years at any rate it will be sufficient and preferable that the fellings and working shall be limited by cultural considerations, a certain margin being fixed arbitrarily as a check or maximum; instructions on this subject would be given in the Working Plan under the head "Method of conducting the fellings."

20. It is Mr. Manson's opinion, after examining in detail a large portion of the forests, as it was Mr. Chester's, that the stock existing is on the whole far greater in volume than the normal stock would be, supposing age classes were established; but the quality of the material is undoubtedly inferior. Large trees exist over much more than half the entire area to be dealt with in the plan; there is much dead wood on the ground and many blocks are very well stocked, whilst, excepting Senchal deserted barracks, absolute blanks are very small.

21. *Your paragraphs 7 and 8.*—We do not anticipate any great trouble in dealing with the grazing question. Though the grazing of the number of cattle that has been found sufficient to meet requirements is not so heavy as to cause *great* devastation, the reproduction of the best trees (not only oak and champ) is by no means satisfactory in the blocks where grazing is heaviest. It will be necessary to introduce regularity in the treatment of the forest, so that the closing of areas against grazing may be regulated for a fairly long period, and it is partly on this account that we advocate the eventual working of the greater part of the forests as nearly as possible according to the uniform method. The question will be dealt with and the estimate of grazing requirements fixed in consultation with the Deputy Commissioner of Darjeeling,

22. *Paragraph 9 of your letter.*—This is being generally acted up to, except that the Singalila forests are not taken in, as they are quite separate. Communications have not yet been sufficiently developed to allow of their being worked, and as their management is hampered by sheep grazing, it is not deemed advisable to spend money at present on opening them out

It is proposed also to include the Dhobijhora forest of the Kurseong sub-division in the plan, though it belongs to a separate administrative charge. This forest is a small block of 480 acres only, situated at the extremity of the Senchal southern spur, quite close to the Sepoydhura block. It is too small for a separate working circle by itself even as coppice, for which a portion of the area only would be suitable. The eastern slopes are very steep, those in the south-west are exposed to a hot sun, and two plots on the west are also steep and rocky.

The remainder of this forest might perhaps be worked as coppice with standards, but as grazing has to be provided in this block for a maximum of 70 head of cattle for supply of milk and butter to the Dow Hill Government School, it is doubtful whether the coppice treatment would succeed. Your approval to these modifications is solicited.

23. *Paragraph* 10 *of your letter.*—The instructions will be attended to.

No. 559, dated Simla, the 24th July 1890.

Memo. by—H. C. Hill, Esq., Offg. Inspector-General of Forests to the Government of India.

Copy of the following forwarded to the Secretary to the Government of Bengal, Revenue (Forests) Department, for information of His Honour the Lieutenant-Governor, in continuation of the undersigned's letter No. 232, dated the 14th April last.

No. 558, dated Simla, the 24th July 1890.

From—H. C. Hill, Esq., Offg. Inspector-General of Forests to the Govt. of India,
To—The Conservator of Forests, Bengal.

I have the honour to acknowledge the receipt of your letter No. 87DF—M of the 20th June last, communicating your further views on the subject of the Darjeeling Forests Working Plan in connection with the remarks on the subject of this plan contained in my letter No. 231 of the 14th April last.

2. In reply, I have to say that I entirely approve of your suggestion that the forests occupying the upper portions of the highest ranges and the more exposed situations, together with those situated on very steep slopes, whether in the upper or lower zones, or on the poorest soils, should be marked off for permanent treatment by the selection method.

3. As regards the remainder of the forest area, it appears to me that the arguments you adduce against the employment of the coppice method of treatment are by no means conclusive. Should you, however, on further consideration still hesitate to adopt this method, I do not desire to insist on it, and am prepared to agree generally to your proposal to subject those areas, which it is not necessary to treat permanently by selection method, to improvement fellings with a view to their ultimate treatment by the uniform method of successive regeneration fellings.

In this case it will, however, be necessary that the limits of the periodic blocks in each working circle should be definitely laid down and the operations to be carried out in each such block and during the first period of the provisional rotation, during which the necessary series of age classes will be established, prescribed. The plan should also prescribe the carrying on of selection fellings in those periodic blocks which will not come under regular regeneration in the immediate future.

4. As regards the other points noticed in your letter, it is only necessary for me to remark that I agree to the fellings being for the present confined to within the capability of the forest by means of cultural rules, provided that the area in which each operation is to be carried out each year is prescribed. This will not, however, obviate the necessity for making an accurate forecast of the outturn.

5. In conclusion, I venture to suggest that the Working Plan for the Darjeeling Forests, which has been under discussion for several years, should now be drawn up without any further delay.

No. 193DF—G, dated Darjeeling, the 22nd September 1890.

Memo. by—A. L. Home, Esq., Conservator of Forests, Bengal.

Copy of the following, with copy of enclosures, and of the Inspector-General's letter No. 558, dated 24th July 1890, forwarded to the Secretary to the Government of Bengal, Revenue Department (Forests), for information, with reference to correspondence resting with this office endorsement No. 93DF—G, dated 20th June 1890.

No. 27DF—W, dated Darjeeling, the 22nd September 1890.

From—A. L. Home, Esq., Conservator of Forests, Bengal,
To—The Deputy Conservator of Forests, Working Plans Division.

In reply to your letter No. 630, dated 10th instant, I have the honour to inform you that I have provided, in my revised estimate for the current year, for funds to meet Mr. Haines' pay for five months. I hope he will be available from the end of October, when Mr. Heinig will return from privilege leave.

2. I did not anticipate that, without the assistance of a gazetted officer, you would be able to carry out the Inspector-General's orders regarding an accurate forecast of the outturn

contained in paragraph 4 of his letter under reference, within a short period, and I expect it will probably take you and Mr. Haines the whole of next working season. I am satisfied that neither of you will spare yourselves, however, in your endeavour to complete the work with as much despatch as possible, in accordance with my own desire, as well as that of the Inspector-General of Forests to the Government of India.

No. 630, dated Darjeeling, the 10th September 1890.

From—F. B. MANSON, Esq., Deputy Conservator of Forests, Working Plans Division,
To—The Conservator of Forests, Bengal.

WITH reference to your letter No. 17DF—W, dated 15th August 1890, and our interview the other day on the subject, I have the honour to say that the necessity of making an accurate forecast of the outturn as ordered in paragraph 4 of the Inspector-General's letter No. 558, dated 24th July 1890, will necessitate at least another field season in order to estimate the yield, for the first period, of each block in different working circles.

2. It is quite impossible for me to do this, without assistance at any rate, if paragraph 5 of the Inspector-General's letter is to be complied with. I have therefore to request that you will kindly grant me the assistance of another officer, and I shall be pleased if you can let me have Mr. Haines as proposed.

3. It is of the greatest importance that this work should be commenced as soon as the atmosphere is clear. October and November are generally the best months. Later on the forests are generally shrouded in mist for a great part of the day, and this fact has already greatly interfered with work in connection with the Working Plan, which I was not free to devote my full attention to until December last.

4. Mr. Chester's enumeration of stock, made in order to estimate the general capability, extended over 2,743 acres, but this was considered by the Inspector-General to be far too small an area; and although it will be useful as a guide, it will be necessary to enumerate the stock in other areas which will be worked during the first period. The formation of several working circles and the larger area of forest to be comprised in the Working Plan will necessitate the enumeration being more extensive than that made by Mr. Chester.

5. The area to be comprised in the Working Plan is nearly 25,000 acres, and the enumeration will probably extend over 5,000 to 6,000 acres. The work is particularly laborious in these hills, and want of roads and paths and the occurrence of mist makes it slow work also.

No. 208DF—M, dated Darjeeling, the 22nd September 1890.

Memo. by—A. L. HOME, Esq., Conservator of Forests, Bengal.

COPY, with copy of the letter under reply, forwarded to the Inspector-General of Forests to the Government of India, for information, with reference to his letter No. 558, dated 24th July 1890.

No. 1007, dated Calcutta, the 31st December 1890.

Memo. by—The Officiating Inspector-General of Forests.

COPY forwarded to the Secretary to the Government of Bengal, Revenue (Forests) Department, for the information of His Honour the Lieutenant-Governor, in continuation of endorsement No. 559, dated the 24th July last.

No. 1006, dated Calcutta, the 31st December 1890.

From—H. C. HILL, Esq., Offg. Inspector-General of Forests to the Government of India,
To—The Conservator of Forests, Bengal.

IN reply to your letter No. $\frac{D.F.}{274M.}$, dated the 4th instant, enclosing a further memorandum on the proposed Working Plan for the Darjeeling Forests, I have the honour to say that, after consideration of what is stated in your memorandum, I accept your proposals with the following slight modifications.

2. *First*, as regards your proposal to exclude the Singalila Forests from the area dealt with in the present plan, I approve of the working of these forests being dealt with in a separate report; but I am of opinion that in that case they should form a separate charge (Range or Forester's beat) from the Darjeeling Forests. The two charges could, for the present, be held by one officer, if necessary.

Second, with reference to the method of treatment, I accept your proposals, provided the period of time in which the selection fellings are made to pass over the four blocks (II to V) in each working circle, which are not being artificially regenerated, is extended beyond the

five years you propose to whatever number of years is required for the regeneration fellings made in block I to pass *once* over the whole area of that block. These selection fellings should be prescribed by area, and the areas to be felled should be marked on the ground; but if, as I understand, there are difficulties in the way of marking out the *annual coupes* on the ground, at least the number of years in which *each block*—the boundaries of which would be marked and shown in the map—would be worked over, should be prescribed, and there should be no repetition of the fellings in these blocks once they are exploited. The nature of the fellings to be made in each block could be explained in detail in the "descriptions" attached to the report, and the areas to be felled, prescribed in the following manner:—

Year or period of working.	Area to be taken in hand.	
	Name of block.	Area in acres.
1890-91	Katqui (172 acres)	43
1891-92 ..		43
1892-93 ...		43
1893-94		43
1894-95	Dumar (168 acres)	56
1895-96		56
1896-97		56
&c.	&c.	&c.

It may be advisable, in order that the areas felled over may be fairly equal from year to year, to work over the smaller of the blocks, or those containing large blanks or areas covered with young growth only, in a fewer number of years than others—in three, instead of four or five years, for instance. There is no objection to this, provided that the whole area is gone over in the prescribed time. But should you find it convenient to fell each of the four blocks II to V in each circle in the same number of years—say one-fourth of the area each year—I am of opinion that you would find it more expedient to adopt, instead of the 150 years' rotation you propose, a rotation of 160 years divided into five periods of 32 years each, and to allot a period of 32 years to the regeneration, in *two* separate series of fellings as you propose, of each successive block.

3. Although the plan will be prepared on the basis of a long rotation, the details of the work to be done should only be given for the comparatively short period of 15 or 16 years required to complete the *first series* of regeneration fellings in block I, and to carry the selection fellings once over the whole area of blocks II to V of each circle in the same period of 15 or 16 years. In this way fellings will only be made each year in two places in each circle, viz, in a *coupe* in block I and in a *coupe* in one of the blocks II to V. As you state that there will be at least seven Circles, this will necessitate the carrying on of 14 separate exploitations, which will probably fully occupy the establishment at your disposal.

4 In conclusion, I would observe that, although I have accepted your proposals in view of the greater local knowledge now acquired by you, and possessed by Mr. Manson, I am not wholly convinced that the selection method of treatment and the system of coppice (the standards in which would provide the timber, the want of which you urge as the chief objection to the adoption of this latter method) are not suitable to some portions of the Darjeeling Forests, and there is insufficient evidence before me to show that it will be possible for you, in all cases, to form periodic blocks in the manner you propose. I advise, therefore, that, in the course of further examination or when drawing up your proposals, you should consider still further whether it would not be preferable to apply these methods to some of the working Circles.

5. The plan may now be completed on the lines agreed upon, without any further reference to me.

R. D'R.—Reg No. 3432(*b*)J—128—16 2 93.

TABLE OF CONTENTS.

	Paras.	Pages.
INTRODUCTION	i—x	i, ii
PART I.		
CHAPTER I—		
Name and situation of the forest tract dealt with	1	1
CHAPTER II—		
General configuration of the country	...	1—3
Orography	2	1
Drainage	3	1
Position of the forests with reference to the markets of Darjeeling and Jalapahar	4—11	1—3
CHAPTER III—		
Area statement—		
The most recent map on which the statement is based	12	3
Large scale maps of working-circles prepared for this report	13	5
CHAPTER IV—		
Legal position of the forests	14—20	5—9
The Darjeeling Reserved Forests, the earliest constituted in Bengal	15	5
The Darjeeling Reserved Forests notified under Act VII of 1865.	16	5
British Sikkim Forest Rules	17	5
Bengal Forest Rules	18	5
Early history of the acquisition of the Darjeeling Forests	19	5—8
Rights and concessions	20	9
CHAPTER V—		
The Forest boundaries	21—26	9—11
Description of the marks used, their state of repair and adequacy	21, 22	9, 10
The boundaries not sufficiently accessible	23	10
Discrepancies between the actual boundaries and the recent 2″ map	24	10
Whether a revision of boundaries is needed	25, 26	10, 11
CHAPTER VI—		
The soil—		
General description of the soil	27	11
Aspect in relation to soil	28, 29	12
CHAPTER VII—		
The climate	30-48	12—18
General description of the climate.	30	12
Sources of information regarding the climate	31	12
The seasons	32—34	12, 13
Rainfall, commencement and end of the rains	34—36	13
Drought.	37, 38	13, 14
Excessive or deficient rainfall	39	14
Temperature.	40, 41	14—16
Frost, snow and hail	42—44	16
Humidity	45	16
Cloud	46	16, 17
Wind	47	17
Statistics of rainfall on estates in the neighbourhood of the forests	48	17, 18
CHAPTER VIII—		
General description of the forest crop	49—93	18—31
Composition of the crop.	49—51	18, 19
The undergrowth	52, 53	19, 20
Unpromising appearance of the crop as a whole	54	20
Preponderance of oak and chestnut amongst the large trees.	55	20
The forests were already over mature when reserved	56—58	20, 21
Types of forest met with	59	21, 22
The principal species and their relative proportion	60—63	22, 23
Abundance of small poles available for removal	64	23

	Paras.	Pages.
CHAPTER VIII—*concluded.*		
Reproduction	65—90	23—29
List of plants	91	29
Marketable dimensions attained by the more important timber trees	92	29-30
Cubic contents of trees removed by purchasers	93	31
CHAPTER IX—		
The past system of management	94—136	31—57
Early management	94—105	31—34
The working-plan originated by Sir D. Brandis (1880—90)	106	34, 35
Revision of Sir D. Brandis' plan by Dr. Schlich	107, 108	35, 36
An account of the manner in which the Brandis-Schlich plan was applied	109—136	36—57
As regards method of treatment	109—111	36—38
„ control of the annual yield	112	38
„ the outturn	113—117	39—42
„ the order and arrangement of the fellings	118-19	42—44
„ disposal of the produce	120	44
„ agency of exploitation	121, 122	44—46
„ departmental fuel operations	123—132	46—51
„ provisions for grazing	133	51—53
„ plantations	134	53, 54
„ communications	135	54—56
„ buildings	136	56, 57
CHAPTER X—		
Injuries to the forest and their prevention	137—151	57—64
Fires	137	57, 58
Wind	138	58
Frost, snow and draught	139	58
Floods and land-slips	140	58
Offences against the Forest Regulations (grazing)	141, 142	58, 59
Damage done by wild animals	143	59
„ climbers	144	59, 60
„ epiphytic and parasitic plants	145, 146	60
„ weeds	147	60, 61
„ dead and decaying trees	148	61
„ human agency	149	61
„ injurious insects	150	61
„ enclosures of private lands	151	61
The Forest staff	152—154	61—64
CHAPTER XI—		
The products yielded	155—168	64—73
Summary of outturn of the ten years (1880—1890)	155	64, 65
Outturn removed by Government Agency	156	65
„ „ by purchasers	157—165	66—71
„ „ by free grantees	166	71
„ of the Singalilá Forest	167	72, 73
Demand on the different parts of the forests	168	73
CHAPTER XII—		
Extraction of the produce	169—176	73—75
Roads and rivers and their adequacy	169—175	73, 74
Buildings	176	74, 75
CHAPTER XIII—		
Markets, and other means of disposing of the produce	177—207	75—96
Forest products exported from the district	177	75
Population in and around the forests	178, 179	75, 76
The principal local markets	180	76
The Darjeeling market	181—188	76—81
„ Jalapahar „	189—194	81—83
„ Tea plantations	196—202	83—90
Produce obtained from private forests	203, 204	90—95
Other markets	205	95, 96
Produce consumed by right-holders and others	206	96
Estimated current annual demand for forest produce	207	97
CHAPTER XIV—		
Past revenue and expenditure (1880—1890)	208-209	96—100

PART II.

	Paras.	Pages.
CHAPTER I—		
Division of the area into working-circles	210—216	101
CHAPTER II—		
The Working-plan		102—133
SECTION I—		
Detailed description of the forests	217	102
SECTION II—		
The method of treatment to be applied	218—228	103—106
General object of management	218	103
Method of treatment	219	103
Reasons for adopting this method	221—222	103—104
Permanent treatment by selection-fellings not generally necessary	223—224	104
Coppice treatment unsuited	225—227	104—105
Rapid growth of Darjeeling	228	105
SECTION III—		
The rotation		106—107
Opinions regarding the rotation	229	106
The struggle for existence	230	106
Counting of annual rings	231	106
Calculation of the length of the rotation	232	107
Periods into which divided	233	107
SECTION IV—		
Calculation of the annual yield and area to be exploited annually		108—110
The basis of control	234	108
Limitation of outturn of regeneration-fellings	235	108
Amelioration-fellings	236	108
Expected outturn	237	108
The term for which fellings are regulated; early revision necessary	238	108
Measures taken for obtaining a sustained yield	239	109
Possibility in number of trees, how fixed	240	109
Average volume of the trees to be felled and the number per acre	241	109
SECTION V—		
Order and arrangement of the fellings		110—121
The location of coupes	242—244	110—116
Statement of annual fellings in each working-circle	245	117—118
Special remarks on the manner of conducting the fellings applicable to all the working-circles	246—248	118—120
Forecast of the condition of the crop at the end of the first half-period	249	121
SECTION VI—		
Disposal of the produce		121—124
The agency of exploitation to be employed	250—251	121
Grazing management	252—254	122—124
SECTION VII—		
Works of improvement (special)	255—303	124—133
Senchal Working-circle	256—264	124—128
Mahalderam Working-circle	265—271	128—129
Takdah Working-circle	272—278	129—130
Tasiding Working-circle	279—285	130—131
Posambing Working-circle	286—291	131—132
Mim Working-circle	292—297	132—133
Nagri Working-circle	298—303	133
CHAPTER III—		
Works of improvement (general)		134—142
Roads	306—308	134—137
Buildings	309—312	138—139
Boundaries	313—314	140—141
Protection from fire	315	141
Other works	316—320	141—142
CHAPTER IV—		
Forecast		142—149
Forecast of outturn	321—329	142—146
Estimate of revenue and expenditure under the proposed system of management	330—331	146—149

APPENDICES.

APPENDIX I—

Pages.

Statistics relating to climate . . . . . i—vii

The climate of Darjeeling :—

1. Table of Rainfall i
2. „ of Temperature ii
3. „ of Humidity ii
4. „ of Cloud ii
5. „ of Wind velocity iii

Rainfall on tea estates near the forests, monthly and according to seasons :—

6. Rainfall north of Goompahar Range and of Mim Working-Circle . . . iii
7. Ditto ditto ditto and of Tasidong ditto . . . iii, iv
8. Rainfall south of Goompahar Range and of Nagri Working-Circle . . iv
9. Ditto ditto ditto and of Pasambing Working-Circle, and west of Senchal Working-Circle . . . . . iv, v
10. Rainfall west and south of Mahaldaram Working-Circle . . . . v, vi
11. Rainfall east of Senchal Range, and south and north of Takdah Working-Circle . . . . . vi, vii

APPENDIX II—

The Flora . . . . . viii—xvii

List of trees characteristic of the forest at different elevations . . . . viii, ix

Classified list of the more important plants found in the Darjeeling forests . x—xvii

APPENDIX III—

Detailed description of the forests . . . . . xviii—xxvii

Senchal Working-Circle . . . . . xviii, xix

Mahaldaram ditto . . . . . xx, xxi

Takdah ditto . . . . . xxi, xxii

Tasiding ditto . . . . . xxii, xxiii

Pasambing ditto . . . . . xxiii, xxiv

Mim ditto . . . . . xxiv, xxv

Nagri ditto . . . . . xxv—xxvii

APPENDIX IV—

Grazing Rules . . . . . xxviii, xxix

APPENDIX V—

Outturn of five years (1886—1891), according to Working-Circles and agency of exploitation . . . . . xxx—xli

Senchal Working-Circle . . . . . xxx—xxxiii

Mahaldaram ditto . . . . . xxxiv, xxxv

Takdah ditto . . . . . xxxvi, xxxvii

Tasiding ditto . . . . . xxxvii, xxxviii

Pasambing ditto xxxix

Mim ditto xl

Nagri ditto xli

APPENDIX VI—

Schedule of rates for forests produce . . . . . xlii—xlv

APPENDIX VII—

Forecast of outturn . . . . . xlvi—lvi

APPENDIX VIII—

Estimation of contents of type trees . . . . . lvii—lxii

INTRODUCTION.

THE first attempt at a complete working-plan for the supply of Darjeeling and Jalapahar was the draft plan framed by Mr. E. G. Chester, Deputy Conservator of Forests, in 1887. This was intended to supersede the rough scheme prepared by Sir D. Brandis and Dr. Schlich for the supply of the same localities, and which only extended to the year 1890. Mr. Chester's plan was, however, rejected by the Inspector-General of Forests, and it became necessary to submit fresh proposals. These revised proposals are contained in the present report, and are based on the memorandum drawn up by Mr. Dansey, the Conservator of Forests, Bengal, on the 4th December 1890, and on the professional opinion of the Inspector-General of Forests in reference thereto.

(ii). Between the years 1887 and 1891 no progress was made in getting a working-plan ready. A chronic paucity of officers led to repeated interruptions of work in the Working-Plans Division—interruptions extending to many months at a time; and, although one or two outlines of a revised plan were prepared for the opinion of the Inspector-General of Forests, nothing came of them, and practical work was confined to survey work and the collection of a few data.

(iii). In these circumstances it is difficult to estimate the expenditure which can justly be charged to the report now submitted, which is, of course, based to some extent on data collected previous to 1891. A comparison of cost is, moreover, complicated in the case before us by the circumstance that the maps were found to be incorrect, rendering necessary a good deal of survey work and duties not ordinarily coming within the province of the working-plans officer.

(iv). The report was completed in manuscript in December 1891, and the subsequent delay in submitting it is connected with its printing and the time occupied in revising the proofs; the writer having, in the interval, been transferred to the charge of a division (Jalpaiguri) which at that period demanded all his attention.

(v). The forests for which these proposals have been framed are more than usually important, and the conditions relating to them, whether historical or economic, singularly complicated. It thus became necessary to write a report which, when drawn up in accordance with the Inspector-General's Circular No. 9, dated the 23rd December 1890,* could not be otherwise than full.

* Outline of arrangement of subjects to be treated in future working-plans reports.

Notwithstanding, it is believed that only useful matter has been included in the present report; that a knowledge of this matter is necessary to the officer whose duty it may be to carry out the plan, and to a great extent even necessary to a proper understanding of the system under which it is proposed to work these forests in future.

It has been the aim of the writer to arrange the matter in such a way as not to obscure the working-plan itself, which is confined to Part II of the report; the general information on which the plan is based being grouped in Part I.

(vi). The preparation of the statistical parts of the report was rendered more difficult by reason of the alterations which the annual forms have undergone during the past ten years, rendering it necessary to compile much information by the laborious course of sifting the original accounts and returns. It would have been easy, and even justifiable, to say that the information could not be given. But the importance of the demand, considered with reference to the limited area of the forests, and the other special conditions prevailing, seemed to call for very carefully, prepared statistics, and the more so that the views commonly held regarding the sufficiency of these forests for the local supply had to be effectively dispelled.

(vii). There is a good and growing demand for almost every description of produce which these forests yield. The demand for timber is not limited, as in Burmah and most other localities, to a few species, but extends itself to a very large number of species; and the requirements to be met on all sides of these forests are as numerous as they are varied. Having regard to all these circumstances, a full report—even a lengthy report—seemed unavoidable, and the apparent labour connected with its preparation (practically confined to the year 1891) must be the writer's excuse for the time and money expended.

(viii). If approved, the present plan will not undergo revision for ten years; and at whatever time revised, it should be unnecessary to do more than add an appendix to the present report in explanation of the changes determined upon at the revision. And although the present plan is proposed for a period of sixteen years only, the plan for all subsequent periods of sixteen years will not affect Part I, which constitutes the bulk of the report. It will only be necessary to add to it the experiences of the previous sixteen years, &c., &c.

(ix). The preparation of the large map (scale 8″ = 1 mile) in seven sheets occupied much of the writer's time, although it was chiefly done during bad weather when rain or mist interfered with the progress of outdoor work.

(x). Mr. Manson was assisted by two officers, namely, by Mr. H. H. Haines, Assistant Conservator of Forests, from the 22nd December 1890 to the 3rd May 1891, and by the late Mr. F. C. Henvey, Assistant Conservator of Forests, who joined the Working-Plans Division on the 6th January 1891, on his appointment to the Forest Department. Most of the enumeration of the crop was done by Mr. Haines, whose knowledge of the flora has been most useful, both in the investigation of the resources of the forests in the matter of fodder, and in the preparation of a list of the most important plants met with. Mr. Henvey was employed in completing the demarcation and survey of the boundaries of the periodic blocks—a very arduous piece of work, as the block lines in almost all cases follow steep spurs or mountain streams. Mr. Henvey also assisted in copying the large map of the Senchal Working-Circle, and in the preparation of several of the statements contained in the report and its appendices. He was, moreover, reading for his examination in the vernacular, and allowed three days a week, including Sunday, for study.

PART I.

THE FACTS ON WHICH THE PROPOSALS ARE BASED.

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CHAPTER I.

NAME AND SITUATION OF THE FOREST TRACT DEALT WITH.

The forests dealt with.

1. This report relates to all the reserved forests of the Darjeeling Forest Division situated within the hill territory of the Darjeeling civil district, west of the Tista river, excepting the Singalilà forest (area 64 square miles). and the recently added forests of the Tista valley (area 13½ square miles). The impossibility of working the former forest under existing conditions of demand and communications has been considered sufficient reason for excluding the area from the present plan; and as regards the Tista valley forests, this report, once written, could not be altered with a view to their inclusion, and the less so that the flora of this region is totally distinct from what we find in the other circles dealt with in this report. Whilst there were obvious reasons why the preparation of a working-plan for the central circles of the Darjeeling Division should not be still further delayed, it will be quite feasible to take up the Singalilà and Tista valley forests later on, and to bind up the working-plans relating to those areas with the present report. In the interval these forests should be worked on the basis of approved annual plans of operations.

The tract to which this report relates lies within the zone of the Lower or Outer Himalayas, and is thus described in Mallet's 'Geology of Darjeeling and the Western Duars,'—"From Kanchinjinga the Singalilà ridge runs southwards, dividing Nepal and the valley of the Tambar from Sikkim and the valley of the Great Rangit. It is the continuation of this ridge in a south-easterly direction by Tonglu, Senchal and Sitong, with its various lateral spurs, which constitutes the Darjeeling hill territory, west of the Tista. * * * While the Terai stretches along the base of the hills, our territory is divided from Nepal on the west by the continuation of the Singalilà ridge and the Mechi river."

CHAPTER II.

GENERAL CONFIGURATION OF THE COUNTRY.

Orography.

2. Four great hill ranges radiate from a central point at Jorbungalow—a saddle 7,372 feet in elevation—situated to the north-west of Senchal mountain (8,600 feet), the highest point of the tract.

Drainage.

3. The northern slopes of the tract are drained by the Little and Great Rangit, tributaries of the Tista river, which receives the waters of the eastern face; whilst the Mahananda and its feeder, the Balasan, drain the southern and western portion.

Relative position of the forests to the markets of Darjeeling and Jalapahar.

4. The forests occupy the summits and upper slopes of three of the hill ranges mentioned above. On the fourth, which extends northward, are situated the cantonments of Jalapahar, the civil station of Darjeeling, and

several tea estates. Generally speaking, the forests are situated above 6,000 feet. This was the lower limit adopted by Dr. Anderson when forest conservancy was first started in these hills, as being the actual upper limit of native cultivation, and generally of tea cultivation also. (*Vide* Annual Progress Report for 1867-68, section I, paragraph 5.) In some of the ravines the forest descends to 5,000, and at one point as low as 4,000 feet.

5. The three ranges capped with forest are—

(i)—The Goom range, which goes west from Jorbungalow to the frontier of Nepal.

(ii)—The Senchal-Mahaldaram range, which trends generally southward towards Kurseong.

(iii)—The Tungbu or Takdah range, which branches off from the main Senchal ridge below Tiger Hill, takes a north-easterly direction and extends (beyond the forest) to the junction of the Great Rangit and Tista rivers, where the elevation is 680 feet.

The Goom range.

6. The elevation of the crest of the Goom range varies between 7,000 and 7,900 feet.

The principal saddles are:—

Goompahar, elevation about	...	7,250 feet.
Lepchajagat	„	„	...	7,500 „
Sukiapokri	„	„	...	7,000 „
Gairibásh	„	„	...	7,500 „

The forest cart-road passes over all these saddles and rises from the Goompahar saddle (Goom Neck) to the Goom station of the Darjeeling-Himalayan Railway, situated at 7,400 feet.

The lower limit of the forest on both sides of this range is about 6,000 feet, being rarely as low as 5,000 feet.

The Goom range, at least in its western half, is diametrically opposed to the moisture-laden winds from the south. Its southern slopes are generally less steep than those on the north, which are in some places precipitous, as in parts of the Goom, Nai and Rishihat blocks.

The Senchal-Mahaldaram range.

7. The Senchal-Mahaldaram range reaches an elevation of 8,000 to 8,600 feet in its northern half, and about 7,000 feet towards the south.

On the west the Darjeeling hill cart-road, on which runs the Darjeeling-Himalayan Railway, forms, for the greater part, the lower limit of the reserved forest; rising from about 5,500 feet on the south to 7,372 feet at Jorbungalow; but for about 1½ miles south of Jorbungalow, the Dooteria block is situated *below* the road and descends to 5,500 feet (at its lowest point) in the Bing Jhora Moreover, for about 3 miles, near Sonada, the reserved forest does not descend to the cart road.

On the east of the range the lower limit of the reserved forest varies from 5,000 feet (in the Rangjo Valley and near Sureil) to about 7,000 feet near Rangbi.

This range is also exposed; but extending as it does southward and dividing into two at the head of the Mahananda valley near Mahaldaram, many parts are well sheltered from the monsoon winds.

The Tungbu (Takdah) range.

8. The summit of the Tungbu range is rounded, and within the reserved forest varies in elevation from 6,300 to 7,300 feet only, in a distance of nearly ten miles. It joins the spur from Tiger Hill at a saddle 3 miles east of Jorbungalow. The road from Jorbungalow to the Tista Valley and Kalimpong crosses this saddle (elevation 7,150 feet), and it is here that the path to Rangbi and the Government Cinchona Plantations branches off, giving access to the reserved forests on the east of the Senchal-Mahaldaram range. On the Tungbu range the forest is situated for the most part on the south-eastern face; whilst at the extremity, a portion, about a square mile in extent, has a north-eastern aspect.

The range is well sheltered, and towards the eastern end of the forest broadens out so as to form almost a plateau, the elevation of which rises from about 6,000 feet at the edge to 6,500 feet in the middle. Rather steep slopes border this plateau, and on these the forest descends generally to 5,500 feet.

9. The foregoing description shows that the country is mountainous; but on the whole the slopes are moderate, precipitous ground being rarely met with. The crests of the main ridges are in general rounded and most of the larger spurs also have this characteristic. The more moderate slopes, however, occasionally break off into steep descents, often marked by the presence of large masses of rock. As a rule gentle slopes occur at westerly and southerly aspects, the steeper ground, characterized by masses of rock, being most frequently found on the northern and eastern faces.

Situation of Darjeeling.

10. The Jalapahar-Darjeeling range, on which is situated the station of Darjeeling, first rises rather abruptly from Jorbungalow to an elevation of 7,886 feet, and then gradually descends to 7,000 feet at the chowrasta in Darjeeling, rising again to 7,163 feet at Observatory Hill. At this point the range divides into two—the Tukvar and Lebong spurs, enclosing the narrow valley of the Rangnit river—a tributary of the Great Rangit. Numerous tea estates occupy the slopes of these spurs.

The Darjeeling railway-station and bazar are at an elevation of 6,820 feet, and most of the private houses are higher than this. The railway line rises slightly, with a gradient of 1 in 57, for about a quarter of a mile, from Jorbungalow to Goom Railway-station (7,400 feet), and thence descends by rather steep gradients to Darjeeling bazar, the distance being $3\frac{1}{2}$ miles.

Course of the water-pipes supplying Darjeeling.

11. The water-supply of Darjeeling is drawn from streams on the west of Senchal. The pipes pass over the Jorbungalow saddle, and are then taken along the eastern face of the Jalapahar-Darjeeling ridge to Darjeeling. The most direct route from Jorbungalow to the Lebong spur (where new barracks are to be built) also lies along this face of the ridge.

The above particulars are important as bearing on the export of produce from the forests to Jalapahar and Darjeeling.

CHAPTER III.

AREA STATEMENT.

The most recent map.

* Trigonometrical Branch, Survey of India. Darjeeling Revisionary Survey, by Colonel H. C. B. Tanner, Bo. S. C., dated August 1884.

12. The subjoined statement of areas is mainly based upon the most recent 2″ map of the district,* a copy of which accompanies this report as a stock-map. Block lines, roads and paths, which were not already shown, have been entered from prismatic compass surveys. Judging from these surveys and a careful examination of the ground, it seems that the main topographical features are shown with fair accuracy on the map; but the interior details of the forest, such as minor streams and ridges, are frequently inaccurate, having evidently been merely sketched in. The main Senchal-Mahaldaram range, between the summit of the Sureil spur and Senchal G. T. S., is even less accurately shown than on the old revenue survey map by E. T. S. Johnson.

Inaccuracies of existing maps taken into account in preparing the area statement.

All discrepancies between the actual boundaries and those shown in the 2″ map, which have been established by survey, have been taken into account in the area statement. A description of these discrepancies is given in paragraph 24.

The cart road reserve land along the Darjeeling-Himalayan Railway has been taken into account in calculating the area. There are no other roads and no rivers within the forest of sufficient width and importance to be deducted from the productive area.

Area Statement.

Names of working-Circles.	Number of periodic blocks.	Area in acres.				Remarks.
		Well-stocked or Wooded.	Poorly stocked or blank.	Enclosures.	Total.	
1. Senchal	I	1,209	340	6§	1,555	§ Nurseries and bungalow compound at Rangirum.
	II	1,540	...	...	1,540	* Includes thicket in portions worked and planted.
	III	1,570	120	...	1,690	
	IV	1,478	120	2†	1,600	† Paharpur, two acres freehold, belonging to the Maharajah of Burdwan.
	V	360	1,120*	...	1,480	
Total area of periodic blocks ...		6,157	1,700	8	7,865	
Add.—Areas to be worked by Selection :—						
Senchal pasture	S F	259	300	..‡	559	‡ A location, Clover Bank, area unknown, exists in this block, (*see* paras. 151 and 313).
Bara Senchal	S F	625	45	...	670	
Total Senchal Circle ...	...	7,041	2,045	8	9,094	
2. Mahaldaram	I	525	185	...	710	
	II	510	70	...	580	
	III	600	90	...	690	
	IV	670	55	...	725	
	V	465	210	..	675	
Total area of periodic blocks ..		2,770	610	...	3,380	
Add.—Areas to be worked by Selection :—						
Chattakpur ridge ...	S F	475	..	...	475	
Sureil	S F	275	310	...	585	
Total Mahaldaram Circle ...	..	3,520	920	...	4,440	
3. Takdah	I	195	260	...	455	
	II	435	30	...	465	
	III	225	150	...	375	
	IV	235	190	...	425	
	V	170	310	..	480	
Total Takdah Circle ...	...	1,260	940	...	2,200	
4. Tasiding	I	340	160	...	500	
	II	280	140	...	420	
	III	332	68	..	400	
	IV	270	105	...	375	
	V	505	20	...	525	
Total Tasiding Circle ...	...	1,727	493	...	2,220	
5. Posamding. ...	I	134	160	11*	305	* Part of Sukiapokri location.
	II	275	100	..	375	
	III	310	45	...	355	
	IV	265	90	...	355	
	V	220	160	..	380	
Total Posambing Circle ...	..	1,204	555	11	1,770	
6. Mim	I	310	110	..	420	
	II	350	130	...	480	
	III	337	20	3*	360	* Part of Sukiapokri location.
	IV	332	13	...	345	
	V	333	35	2†	370	† Part of Simánabasti location (*see* Notification dated 23rd January 1879, under section 34 of the Indian Forest Act).
Total area of periodic blocks ...		1,662	308	5	1,975	
Add.—Areas to be worked by Selection :—						
Jorpokri ridge ...	S F	184	15	10*	209	* Jorpokri location (*see* Notification dated 23rd January 1879, under section 34 of the Indian Forest Act).
Majdura „ ...	S F	10	16	5†	31	† Part of Sukiapokri location.
Dungdungia	S F	170	20	...	190	
Total Mim Circle ..	...	2,026	359	20	2,405	
7. Nagri	I	230	225	...	455	
	II	470	...	..	470	
	III	472	10	8†	490	† Part of Simánabasti location.
	IV	505	...	...	505	
	V	235	340	...	575	
Total Nagri Circle ...	...	1,912	575	8	2,495	
Grand Total ..	...	18,690	5,887	47	24,624	

13. A map on the scale of 8″=1 mile has been prepared by congregating the boundary survey maps and filling in such interior details (roads, paths, block-lines, bathán̄s,* &c.) as have been fixed by survey. Thus there has been a check on the areas computed from the 2″ map, and they may be accepted as fairly approximate.

Large scale map.

This 8″ map has been copied and is submitted with this report. It is in seven sheets, corresponding to the working-circles, and shows the division into blocks as in the above statement. It cannot pretend to absolute accuracy, as the instruments used are not capable of very great precision. These were the plane-table, as well as compass and chain for most, if not all, of the boundary surveys (*vide* Annual Report, 1883-84, paragraph 39), the latter only being used for interior details. It is not considered necessary to have recourse to a new and more accurate survey of these forests until the time arrives for revising the present working-plan.

CHAPTER IV.

LEGAL POSITION OF THE FORESTS.

14. On the 4th February 1890 a notification was issued, directing a further enquiry into the question of rights, and pending the completion of this inquiry it seems unnecessary to treat this subject in detail. It may, however, be useful to refer briefly to records wherein the early history of the forests may be found, and to show how the area has been gradually made up.

15. When forest conservancy was first started in Bengal the beginning was made in the Darjeeling district (British Sikkim). This territory, ceded to the British Government in 1835, was annexed after the military expedition of 1850. A notification was published in the *Calcutta Gazette* of the 21st December 1864 (page 2268), reserving forest lands in Darjeeling, at and above an elevation of 6,000 feet, from sale under the Waste-Land Rules.

Darjeeling reserved forests the earliest constituted in Bengal.

16. The Government Forest Act, VII of 1865, was promulgated shortly afterwards; and under section II of that Act a notification, dated 13th July 1865, was published in the *Calcutta Gazette* of the 2nd August (page 1288), declaring certain tracts in Cooch Bihar and Darjeeling to be government forests under the said Act. Again on the 24th January 1866, at page 204 of the Gazette, a notification, dated the 23rd January, was published, strictly reserving certain tracts of land in the Sikkim Terai for forest purposes.

Darjeeling reserved forests notified under Act VII of 1865.

17. Act VII of 1865 was an "Act to give effect to Rules for the management and preservation of Government forests," and accordingly, "Rules for the better management and preservation of Government forests in British Sikkim" were drawn up. These were confirmed by the Governor-General in Council under section 6 of the Act, and published in notification No. 20F, dated the 15th August 1866 (*vide Calcutta Gazette* of the 5th September 1866, page 1555).

British Sikkim Forest Rules.

18. It was not until several years later, when forest conservancy had been extended to other districts, that rules applicable to the forests of Lower Bengal generally were published. These rules were contained in an order of the Government of India, in the Public Works Department, No. 13F, dated the 16th February 1871, and will be found in the *Calcutta Gazette* of the 1st March 1871, at page 454.

Bengal Forest Rules.

19. It is difficult to trace clearly the early history of the Darjeeling forests, as up to the beginning of 1872-73 (*vide* Annual Report, paragraph 106) "neither the exact areas had been ascertained nor were maps (of the forests) available." In the table given on pages 7 and 8, the year 1872-73 has therefore been taken as the starting point, and for the period antecedent to this, the following notes are given regarding the temperate forests of the Darjeeling hill territory, which alone form part of the tract dealt with in the present report.

Early history of the acquisition of the Darjeeling forests.

* Cattle stations.

The Annual Progress Report for 1865-66 (Appendix C) gives a list of the reserved forests of British Sikkim, which are said to be bounded as follows:—

(1) All forests situated above an elevation of 6,000 feet above the sea, and including the cantonment lands of Jalapahar and Senchal, but excluding the municipal forests on the Goompâhar range. (Annual Report, 1867-68, paragraph 6.)

(2) The forests on the Lebong Hill included between Mr. Grant's location and Ging.

These forests are again described in the Annual Progress Report for 1868-69, paragraph 79, as the reserves constituted by public notification and legal declaration, viz., on the 13th July 1865. In this report it is also stated that several changes in the area of the state reserves of British Sikkim had taken place since their original demarcation. These changes consisted principally in the addition of forest lands resumed by Government from Mr. Barnes. Some reduction in the area of the forests was also made by the appropriation of the land and small forest situated on the Lebong spur, for the use of the Agent of the Sikkim Raja and Thibetan travellers in general. At this period (1868-69) the total area of the state forests in British Sikkim on hill and plain was said to be about 70 square miles. Of this area the government forests in the temperate parts of British Sikkim "covered an area of about 17½ square miles in four blocks—2, 4, 5½ and 6 miles each." The last three blocks only were accessible or capable of being made so; the first 'Nagri Danda' was considered to be so isolated that it might be left out of account for the time; and it was eventually surrendered to the revenue authorities.

No addition was made to the reserves in 1870-71. On the other hand, in March 1870 the authority of Government was sought for the restoration to the Revenue authorities of two estates—Thurboo and Rungdo, as containing no timber and being ill-suited for plantations, as also for the surrender of a tract of land on the Tukvar spur said to be of no value to the Department; and we find that these areas were given up during 1870-71 and struck off the list of Reserves. Perhaps this may simply mean that the reservation from sale under the Waste-Land Rules was withdrawn.

The 17½ square miles above referred to are described in the Annual Progress Report for 1867-68, section I, paragraph 5, thus:—

	Square miles.
Ridge between Jorbungalow and Kurseong, west slope	5½
Same ridge and spur to Rangbi, east slope	6
South end of ridge between Balasan and Mahanadi	4
Nagri forest	2
Total ...	17½

This area included three square miles of land reserved for cinchona cultivation, so that the area of the forests was practically 12½ square miles.

As regards the settlement of the reserves and enquiry into rights under Act VII of 1865, it has to be remarked that the old records bearing on the subject perished on the occasion of the Commissioner's office being destroyed by fire in 1878; but that the enquiry into rights was not neglected is evident from the following references:—

Letter No. 390, dated Camp Jalpaiguri, 23rd September 1869, from Lieutenant W. Stenhouse, Officiating Conservator of Forests, Lower Provinces, to Colonel J. C. Haughton, C.S.I., Commissioner of the Cooch Bihar Division, adverts to the investigation and recording of the nature and extent of forest rights, and contends that the forest officer should be admitted to take part in it. (Government of Bengal Proceedings for March 1870.)

Again, with reference to the Bykuntpore estate in the matter of drift, (Bengal Proceedings for March 1870), a special Deputy Commissioner is spoken of, and his enquiries are said to be then in progress (28th December 1869), and his camp at Sidlee.

Thus it would seem that the enquiry regarding rights was formerly conducted with even greater care than can be the case at present when the district officer is, as a rule, appointed to be Forest Settlement Officer in addition to his other duties.

Statement showing the progress made in the constitution of the Reserved Forests of the Darjeeling Division from 1872-73 *to* 31*st March* 1891.

Year.	Name of Forest Division.	Particulars of forests added or excluded.	Act.	Section.	Date.	Effect from—	Area.						Remarks.
							Added.		Excluded.		On 31st March.		
							Acres.	Square miles	Acres.	Square miles.	Acres.	Square miles.	
1871-72	Sikkim ...	Not known.	VII / 1865	II	13th July 1865 ... 24th January 1866	.....	...	...	...	...	...	105·3	
1872-73	Cooch Bihar ...	9 Plain forests, 30·7 sq. miles ; 21 Hill forests, 74·6 sq. miles.	Ditto ...	...	.....	.....	...	...	...	...	...	106	*Vide* Annual Report, paragraph 105, and form at page 61.
1873-74	Ditto ...	*Added*—Muraghat and Dainah forests.	Ditto ...	II	14th March 1874 ...	.....	...	14	...	...	...	120	The Cooch Bihar Division comprised the Sikkim and Western Dooars subdivisions.
1874-75	Darjeeling ...	*Excluded*—Ditto ditto ...	...	...	.....	.....	...	...	...	14	...	106	Formation of Jalpaiguri Division ; separation of Assam.
1875-76	Ditto ...	No change	...	...	.....	.....	...	...	...	...	...	106	
1876-77	Ditto ...	*Added*—Dumsong	VII / 1865	II	4th September 1876	.....	...	50	...	...	...		*Vide Calcutta Gazette* of 4th October 1876, Part I, page 1250.
		„ Takdah block	Ditto ...	II	4th November 1876	.....	844	1	...	...	...	161	*Vide Calcutta Gazette* of 8th November 1876, Part I, page 1342.
		„ Hill forests west of Tista river, correction of area.	...	...	.....	.....	...	2	...	...	...		
		„ Terai forests	...	...	.....	.....	...	2	...	...	...		
1877-78	Ditto ...	*Excluded*—To form Tista Division.	...	...	.....	.....	...	...	...	57	16,917	26*	* For details of the blocks composing this area, *vide* Annual Report for 1877-78, paragraph 44.
		„ „ Kurseong ...	...	...	.....	.....	...	...	...	78			
1878-79	Ditto ...	*Added*—Goompahar, made over by the Municipality.	VII / 1878	34	23rd January 1879*	.....	3,000	5	...	...			* *Note.*—All the forests were gazetted under section 34 of the Indian Forest Act, VII of 1878, *vide* notification dated 23rd January 1879, reprinted as Appendix A of Annual Report for 1878-79.
		„ Rangirum, old Botanical Garden.	...	...	.....	.....	75						
		„ Poomong, khas land ...	...	...	.....	.....	1,500						
		„ Land at head waters of the Rangjo and Ranbi rivers transferred from Government Cinchona Plantation	..	...	.....	.....	2,500	6½	...	...	23,592	37	
		Excluded—Takdah, below Pashok road			Executive order of Government.		...	...	400	½			To be leased to Pemchuda Lama, *vide* Annual Report, paragraph 41.
		Exchange—Dooteria block, with Dr. Brougham.	...	..	.....	.....	97	...	97	...			The Agri-horticultural block.

Year	Name of Forest Division.	Particulars of forests added or excluded.	Act.	Section.	Date.	Effect from—	Area.						Remarks.
							Added.		Excluded.		On 31st March.		
							Acres.	Square miles	Acres.	Square miles.	Acres.	Square miles.	
1879-80	Darjeeling ..	*Added.*—Palongdong, by rectification of areas, 450 acres.	...	...	.....	.....	710	1	...	...	21,351	33½	
		,, Between Chongtong and Lainkup spurs, ditto, 260 acres.											
		Excluded.—Rectification of error regarding Rangli-Rangliot and Gielle blocks.	...	...	.....	.....	...	...	2,951	4½			
1880 81	Ditto ...	*Added*—Pagraingbong	VII 1878	19	19th July 1880 ...	1st August 1880	435	1	...	...	25,584	40	For areas, see Annual Report, paragraph 11.
		,, Rangjo, 272 acres	VII 1878	19	25th March 1881 ...	1st April 1881	3,616	5½	...	...			
		,, Sureil and Mamrim (3344 acres) (Memrem).											
		Added and Excluded—Parmaigiri by rectification of areas.	...	...	.....	.....	250	...	68	...			
1881-82	Ditto ...	No change	...	...	.....	.....	...	...	...	...	25,584	40	
1882-83	Ditto ...	*Added*—Singalilà, purchased ...	VII 1878	19	22nd September 1882	16th October 1882.	41,254	64½	...	...	64,842	101½	Goompahar Range, 156 acres; other ranges 1,840 acres
		Excluded—Rectification of areas	...	...	.....	.....	...	...	1,996	3			
1883-84	Ditto ...	*Added* -Goompahar, purchased from the Municipality.	VII 1878	19	16th December 1883	1st January 1884	700	1	...	...	65,542	102½	Goom block, 600 acres; addition to Tungsong block, 100 acres.
1884-85	Darjeeling Division.	*Excluded*—Rangbong, surrendered to Deputy Commissioner, to be leased to Achay Lall.	VII 1878	26	8th November 1884	20th November 1884.	...	...	64	...	65,478	102	
1885-86	Darjeeling subdivision.	*Added*—Rinchingtongdara, two small blocks.	VII 1878	19	10th March 1886 ...	30th March 1886	55	...	...	...	65,533	102	
1886-87	Ditto ...	No change	...	..	.....	.....	...	...	...	...	65,533	102	
1887-88	Ditto ...	Revision of block areas in Singalilà forest.	...	...	.....	.....	1,430	2¼	1,430	2¼	65,533	102	
1888-89	Ditto ...	No change.	...	...	.....	.....	...	...	...	...	65,533	102	
1889-90	Ditto ...	Sukiapokri location* made over to the Deputy Commissioner, with effect from 23rd March 1890 by executive order of Government, dated 1st May 1889.	...	...	.....	.....	...	...	...	...	65,533	102	* Area 19 acres 32 poles continues to be 'reserved forest,' see Deputy Commissioner's letter No. G358, dated 11th July 1890, to the address of the Assistant Conservator of Forests, Darjeeling.
1890-91	Ditto* ...	*Added*—Sepoydhura locations (part).	VII 1878	19	9th August 1890 ...	15th August 1890.	7	...	...	...	65,540	102	* Again made a Division with effect from the 1st April 1891.

20. So far as is known no rights exist. A re-enquiry into the subject has, however, been ordered by the Local Government, as explained in paragraph 14.

Rights and concessions.

A portion of the forest area was obtained by transfer from the Government Cinchona Department under an agreement with the Superintendent, Dr. King, relating to the maintenance of roads and the supply of forest produce to the Cinchona Department on certain terms. This agreement was approved by the Superintendent in his letter No. 93, dated July 31st, 1880, and was reproduced in Mr. Chester's draft working plan as Appendix No. 6. A proposal has recently been made by the Officiating Superintendent to modify this agreement, and is now under consideration.

Agreement with the Superintendent of the Government Cinchona Plantation.

The transfer, under an executive order of the Local Government, of 19 acres 32 poles of land at Sukiapokri to the Deputy Commissioner, for a police outpost and bazar site, &c., has been noted in the statement given on page 8.

Sukiapokri settlement.

A concession has been made by the Conservator allowing the Municipality of Darjeeling to lay water-pipes and construct reservoirs in the Rangbul reserved forest, and for this purpose to occupy, free of cost, a strip of land 6 feet wide, the length of which has been increased from time to time as it became necessary to tap other streams. (*Reference*, Conservator's letter No. 317 $\frac{DF}{M}$, dated 29th November 1888, and others.)

Municipal water-pipes.

A concession was granted to the Officer commanding the Mountain Battery at Jalapahar to bury mules in the Dooteria reserved forest to the north of the Ranger's house near Jorbungalow. (*Reference*, Conservator's letter No. 315 $\frac{DF}{D}$, dated 9th January 1888.)

Permission to bury mules in the forest.

Permission has on various occasions been given to the Public Works Department to make diversions of roads without reference in cases of urgency, as when land-slips occur; and also, subject to certain restrictions, to remove and quarry stone required for the construction and repair of public works. (*Reference*, Conservator's circulars No. 74D. F., dated 27th October 1887, and No. 23 T. P. and 196 T. P., dated 23rd April 1891 and 21st October 1891, respectively.)

Operations of the Public Works Department.

CHAPTER V.

THE FOREST BOUNDARIES.

21. Except along rivers and some of the larger streams, the hill cart-road and the frontier of Nepal, boundaries, both internal and external, are marked for the most part by rough wooden posts of soft wood with irregular heaps of stone at their base, and by lines cleared, about ten feet in width, from post to post. In one or two places, where boundary disputes had occurred and been settled, masonry pillars have been erected, but are generally badly built. One or two triangular stone posts, introduced at the time of Captain Harman's survey (1879-81), have also been used. These, which are of a rather soft sandstone, are used by coolies as whetstones to sharpen axes or 'kukris', and are consequently in an indifferent state of repair.

Description of marks used.

22. The wooden posts are not always in good condition, and when posts have been renewed, as has frequently been the case with 'kachcha' posts of late, the number assigned to the posts in the boundary record or map has seldom been marked on the new post. The cost of renewing the posts is not less than four annas each, and their life is about 3 years. As the lines are cleared every year, and the annual growth of grass and weeds on the lines rarely exceeds 3 or 4 feet in height, there is no object here in having tall posts as in the Terai: indeed there seems to be no absolute need for posts at all: the number could easily be marked on masonry or concrete pillars, and would be durable if well done (see para. 314).

State of repair and adequacy.

In several places intermediate pillars are needed; for instance on the northern boundary of the Goompahar forest, where the boundary pillars are

at distances as great as 3,250 and 2,000 feet apart, generally on ridges, with deep valleys and ravines intervening, so that a person stationed in the valley cannot see the boundary posts or be sure that the line lies straight between them. The consequence is that, during the rains when the lines are overgrown with jungle, the boundary is in many places not recognizable where scrub growth is found on both sides of the line. For the same reason cattle-trespass occurs with impunity when it might be prevented if the demarcation was more complete.

Boundaries not sufficiently accessible.

23. The boundary lines are in places difficult of access. Communications, for the most part, follow the main ridges, so that in order to visit the boundary at any one point it is generally necessary to go down steep spurs on foot, returning the same way; in other words, to descend from one to two thousand feet and to reascend to the same height.

Discrepancies between the actual boundary and the recent 2″ map.

24. The following discrepancies appear on comparing the actual external boundary lines with those shown on the 2″ map (revisionary survey). They all occur in the Goompahar forest, and are indicated on the 2″ map submitted with this report as follows:—

A,B.—In the Goom block (block 1 of Tasiding Working-Circle), the actual boundary line between the reserved forest and Soom Tea Company's land is not straight as it should be: the portion of forest land thus excluded between A and B is about 18 acres.

C,D,E.—In the Tungsong block (block V of Posambing Working-Circle) the lines *C,D,E* show the boundary as demarcated by the Court Surveyor in January 1888, in settlement of a long-standing dispute (*vide* paragraph 8 of the Annual Progress Report for 1887-88). A comparison of the 2″ Revisionary Survey map with the old 2″ map of the district by E. T. S. Johnson, Revenue Surveyor, on which the parties relied, shows that there is the same discrepancy between them, and that the line laid down by the Court Surveyor agrees as nearly as possible with Johnson's map. The area comprised between the two lines is about 34 acres.

F,G.—In the eastern half of Chongtong block (block I of Mim Working-Circle) the line FG represents the boundary as shown in the recent 2″ map, whereas the actual boundary runs as marked on the maps submitted with this report. The boundary survey maps show the actual line.

The northern (or lower) boundary of the Parmaigiri block would seem to be actually higher up the hill than is shown in the boundary map and in the 2″ map, which agree closely. The area may, therefore, be found to be somewhat less than is given in the tables. This opinion is based on the survey of the block lines, which was connected with the Nepal frontier boundary pillar No 22 at Simanabasti. A check-line was also surveyed, connecting the line between blocks III and IV with the 9th mile-post on the new cart-road, and this survey gave the same result, viz., that the actual boundary was found to be some 500 feet (horizontal) higher than the line shown on the published maps. In calculating the areas of the periodic blocks, half the discrepancy has, as a matter of prudence, been allowed for.

The boundary of Clover Bank location must be settled or the land acquired (*See* paragraphs 151 and 313 (4)).

The demarcation should be verified in the sense of the above remarks.

Revision of boundaries.

25. A revision of the boundaries is not absolutely necessary, and would probably not be possible to any useful extent. In the course of the impending forest settlement some modifications may, however, be made. If so, it would be advisable to alter the outer boundary in such a way as to include land on the principal spurs, so that a road might be made following the contour of the hills near the lower boundary of the forest, but always within it.

Extension of the area of the reserved forests near Darjeeling.

26. The area of the reserved forests might be added to in several directions with advantage. Thus, it would be well to acquire land between the Tungsong and Dooteria blocks, and on the other side of Jorbungalow, below the Calcutta road, where the ground is steep and liable to slip. The land in the former case belongs to the Municipality (*see* paragraph 203 (*c*) and in the

latter to the Maharaja of Burdwan. A clearance of the forest has lately been effected in the Maharaja's land, and if this is not soon planted up again, there is reason to fear that serious landslips will occur, as they have already occurred at Jorbungalow, and on a large scale at Alubari, opposite Rangirum.

The block marked Soom land W. L. 45 on the 2″ map would round off the forest boundary conveniently, and be very useful for the grazing of cattle for the supply of milk and butter to Darjeeling. If acquired, this or an equivalent area should be set aside permanently for grazing, for the erection of bathán̄s in which stall-feeding may be enforced, and for establishing dairies which may be subject to proper inspection by the sanitary authorities.

An addition to the forest on the north face of the Takdah range is extremely desirable, as on this side it is insufficiently wooded near the top of the ridge, between the 5th and 9th mile-posts on the Pashok road. The land excluded from the forests during 1878-79 and leased to Pemchuda Lama should, if possible, be resumed on the expiry of the current lease in 1896. A recommendation to this effect has been made to the Deputy Commissioner in a note on the grazing question, dated the 28th May 1891.

The land between the reserved forest and the hill cart-road, adjoining the Hope Town settlement about Sonada, should be acquired if opportunity offers; for not only is a frontage on the public road very desirable at this point for the export of produce to the tea concerns on the Hope Town spur, but the land between the old military road and the cart-road below Sonada is exceedingly steep and even in some parts rocky and precipitous. A big slip has occurred on this land below the first-mentioned road, close to the forest rest-house, and it is important for the security of the public road and the Darjeeling-Himalayan Railway at the Runumjhora, that the land in question should be kept under forest. If the clearance of the forest is attempted, steps ought to be taken to acquire the land.

For the same reason the land to the south of the Sepoydhura block lying in the catchment area of the Suneasi Jhora above the hill cart-road ought to be re-afforested. The Darjeeling-Himalayan Railway was breached at this point a year or two ago by a sudden torrent in this small stream and expensive works (costing probably not less than Rs. 600) had to be undertaken in consequence. It is only in streams of which the catchment area has been denuded of forest that such dangerous and destructive torrents are to be feared. The Pagla Jhora below Kurseong for instance, though it does not lie within the tract dealt with in this report, may be cited as a striking example of the mischief caused to public communications by the destruction of forest situated in the catchment area of mountain streams crossed by such communications, particularly when the area in question is subject to an exceptionally heavy rainfall, as is the case with the Pagla Jhora. The rainfall of the neighbouring Gumti Tea estate compared with that of other gardens indicates that it is so. During 1890 the total fall was here 319·28 inches, and the repair of the damage done to the cart-road at this point cost Government in that one year alone fully Rs. 64,000, apart from which great expense was incurred by the Darjeeling-Himalayan Railway Company on the repair of their line. The cost of protective works undertaken in the basin of this one stream since 1878 probably amounts to Rs. 30,000 or Rs. 40,000 more.

CHAPTER VI.

SOIL.

General description of the soil

27. Speaking generally, the soil throughout the tract is an excellent forest soil and of remarkable depth. It is formed by the decomposition of gneiss rock, and is admirably suited to the growth of the numerous species of trees and other plants found in the forests. The rock is folded and fractured to such a degree that even where it is not much decomposed plants are able to introduce their roots into the numerous fissures and cracks. The geological formation is known as the Sikkim or Darjeeling gneiss, and is of fairly uniform character throughout, except that in the northern, and particularly in the north-western, portion of the Goompahar range a quartzose rock is extensively found. It is generally much shattered and breaks up into angular fragments. A small deposit of plumbago has been found in this rock; and a sample sent to the Geological Survey

Department was reported to be of "fair quality for the manufacture of crucibles and for lubricating purposes:" but the mineral has not been found in paying quantity. The constituents of the gneiss occur in varying proportion, and the soil varies in the same relation. That most commonly met with is a rather stiff, generally reddish coloured loam, probably poor in lime. Its composition varies, however, from almost pure sand (*e.g.*, near Mim Bungalow) to stiff red clay.

Aspect in relation to soil.

28. As a rule, there is greater depth of soil at southern and western aspects; the rock being, on the contrary, nearer the surface on the north and east slopes, and in deep narrow valleys where the sun rarely penetrates. In such places there is generally more leaf mould, the surface soil is light and porous, and frequently covered with begonias, ferns, cane, selaginella, or moss.

Soil on old clearings.

29. Where the forest has formerly been cleared for cultivation and the soil has long been exposed to sunlight and subject to grazing, the ground is found covered with a coating of turf, which renders afforestation a very difficult process, whether it be undertaken artificially or left to the action of nature. When such areas are closed and protected, brambles and other inferior shrubs and weeds very gradually instal themselves, and under their shelter trees (generally of inferior species) spring up, indicating the steps which should be taken to restock these areas.

CHAPTER VII.

CLIMATE.

Importance of the climate as influencing the treatment of the Darjeeling forests.

30. The special character of these forests as a whole is undoubtedly due to the climate which must therefore be described at some length. A study of the climate will, moreover, be amply repaid by the saving of fruitless expenditure upon the cultivation of exotics quite unsuited to the local conditions.

The following extract from Mallet's Geology of Darjeeling and Western Dooars (page 6) gives a good general idea of the climate as regards rainfall and its effects on forest growth:—

"The densely luxuriant vegetation by which these mountains are covered, ranging from the matted canebrakes of the Terai, and the India-rubber trees and other tropical forms of the deep valleys, to the oak and pine forests which clothe the highest ridges, has been described by Dr. Hooker in his journals. He attributes the heavy rainfall to which such luxuriance is largely due to the fact that the alluvial plain between Sikkim and the mouth of the Ganges is almost a dead level, the foot of the hills being only 300 feet above the sea. Hence the vapour-laden southerly winds from the Bay of Bengal reach the outer range of hills without impediment; while the same current, when deflected easterly to Bhutan or westerly to Nepal and the north-west Himalayas, is intercepted and drained of much moisture by the Khasia and Garro hills in the former case, and the hills of Rajmahal and Chutia Nagpur in the latter. Sikkim is hence the dampest region of the whole Himalaya."*

Sources of information regarding climate.

31. There are at present no meteorological statistics for the interior of the forest tract, though an attempt has recently been made to establish observing stations for rainfall and temperature at range head-quarters. Information has, therefore, been compiled from the Meteorological Report of the Province of Bengal (station observations) and from the detailed statements kindly supplied by Mr. Carter, Head Master of St. Paul's School; and the tables of rainfall, temperature, humidity and cloud of Darjeeling thus prepared, which will be found in Appendix I, have been checked and completed at the Meteorological Office, Bengal, through the kindness of Mr. Pedler, Meteorological Reporter to the Government of Bengal, who has added the table of wind velocity. Blanford's "Climates and Weather of India, 1889," has also been consulted. Thanks are likewise due to the tea planters who have obligingly furnished the statistics of weather (chiefly rainfall) on the estates near the forest. These have been tabulated, and grouped according to their proximity to the different working circles, and are also given in Appendix I.

The seasons.

32 In these tables the year has been divided into four seasons as being appropriate for the tract in question: for, owing to the showers which usually fall in April and May,

* Himalayan Journals, volume II, page 388.

the hot weather is moderate and the rise of temperature from March to July is gradual and sustained. Many of the forest trees come into new leaf in April and May, and the germination of seeds of many species also marks the spring time. The autumn also is characterised by the fall of the leaves of many kinds of trees and the tints assumed by the foliage of the maples and a few other trees.

Climate according to seasons.

33. Arranged according to seasons, the mean monthly rainfall, temperature, humidity and cloud may be shown thus:—

	Spring.	Summer.	Autumn.	Winter.
	March, April, May.	June, July, August.	September, October, November.	December, January, February.
Rainfall (sum of normal mean for 3 months)	13·78″	81·05″	23·74″	2·04″
Temperature (normal daily mean) ...	50·1°—56·5°	60·0°—61 8°	60 1°—47·9°	42·9°—39·5°
Humidity (normal mean of month) ...	66—86	93—94	92—69	74—71
Cloud (normal mean of month) ...	4·7—7 5	8·7—8·9	7·9—3·1	3 1—5·1

Regularity of the seasons.

34. The seasons are fairly regular, but exceptional weather occurs at uncertain intervals. In 1878-79, for example, there was a prolonged drought and the district was devastated by jungle fires which raged for months, and even invaded the fir forests of the Singalilà range. The hills were shrouded in dense haze and smoke for several months. The damage done on this occasion led to the passing of the rules (dated the 11th December 1880) for the suppression of forest fires; rules which were then successively extended to the other divisions of the Bengal Circle. It will be useful, therefore, to enter into some particulars regarding vicissitudes of weather which affect the forest treatment or management.

Rainfall.

35. The following table taken from Blanford's "Climates and Weather of India." (Appendix III) shows the mean highest and lowest recorded monthly rainfall in inches:—

Station.		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Darjeeling, 26 to 29 years	Mean ...	0·7	1·1	2·3	3·9	7·2	24·8	30·1	26·5	17·8	6·4	0·2	0·2
	Maximum ...	3·4	3·4	17·4	9·6	13·4	46·4	53·5	43·3	28·8	27·4	1·5	1·9
	Minimum ...		...	..	0·5	2·1	3·0	14·7	13·6	9·2	...	...	...

	Old Observatory, 6,912 feet.			New Observatory, 7,421 feet.		
Rainfall of wettest year	(21 years)	160·9″	(1879)	(5 years)	144·2″	(1882)
,, driest ,,	(21 years)	77·2″	(1873)	(5 years)	107·5″	(1884)
Rainy days in wettest year	(14 years)	171	(1870)	(5 years)	151	(1885)
,, ,, driest ,,	(14 years)	124	(1878)	(5 years)	124	(1883)

(*Blanford, page* 294.)

Some rain falls, as a rule, every month. November and December are the least rainy months; but in some years clouds gather about Christmas, when a few showers may fall. In any case the moisture condenses on the foliage and the drip is considerable. Early spring rain, particularly in the last ten days of March or beginning of April, is most beneficial both to the forests and to the tea industry in these hills: the forests are thereby secured against fire and the tea planters obtain an early and generally prosperous season so far as the production of leaf is concerned.

Commencement and end of the rainy season.

36. The rains (summer monsoon) may be said to begin about the middle of June and end about the middle of October. This year (1891) the weather has been exceptional, with abundant spring rain, frequent intervals of fine weather during the summer, and an early cessation of the rains.

Periods of drought.

37. *Drought*, by which is meant the failure of the winter and spring rain and the more or less prolonged suspension of the summer monsoon, is not of frequent occurrence.

Exceptionally dry weather was experienced in the winter of 1875 and the spring of 1876, when a forest fire threatened the Rangbul plantation and did serious damage to the adjoining forest. Of the plants pricked out in the nurseries during August and September 1875, the walnut suffered the least, whilst the oak and champ succumbed to the drought. It was, however, recognized that the plants had been pricked out too late. The year 1878-79 was remarkable for drought, and forest fires were unusually prevalent. The plantations, however, made on the areas clean-felled in the Rangbul block are said to have been satisfactory, notwithstanding the trying weather, and this was attributed to the system of planting introduced by Dr. Schlich, whereby the horizontal lines of plants were sheltered by an intervening band of jungle. The planting up of blanks in the Sepoydhura block during 1881-82, another dry season, was unsatisfactory, "the difficulty being that the blanks on the hill-side having a south aspect are much exposed, the soil very stiff, and the effects of drought in the winter months very damaging." (Annual Report, 1881-82, paragraph 73.)

Influence of drought on the flowering of bamboos and Strobilanthes.

38. Drought is popularly supposed to bring about the flowering of bamboos and other plants which flower only at considerable intervals and die after flowering. The following appears to be the record of such occurrences in these parts:—

Máling, *Nep.*; Phyung, *Lepcha.* (Arundinaria racemosa, *Munro.*)—Flowered in Sikkim at the end of 1888,—thirty-one years since the last recorded time. (Authority, Mr. J. S. Gamble in a letter dated 20th December 1888.)

NOTE.—The flowering of this species has not lately occurred in the Darjeeling forests.

Gopi, *Nep.*; Payong, *Lepcha.* (Cephalostachyum capitatum, *Munro.*)—Flowered at the end of 1874 and died after seeding (Authority, Mr. Stölke of Rishihat and Gamble's Manual of Indian Timbers, page 429).

Nibha, *Nep.*; Pagjiok, *Lepcha.* (Bambusa patellaris, *Kurz.*)—Flowered at the end of 1871 and died after seeding. (Authority. Mr. Stölke of Rishihat.)

Nigala, *Nep.*; Purmiok, *Lepcha.* (Thamnocalamus spathiflorus, *Munro.*)—Noticed by Mr. C. G. Rogers to be flowering at the end of 1889; also found in flower in the winter of 1890. Seed ripened in 1891.

Kibu, *Nep.*; Púseum, *Bhutia.* (Strobilanthes pectinatus, *T. And.*)—Flowered partially in the summer of 1889 and profusely the following year. The seed ripened in November 1890 and the plants died.

The rainfall of 1888 was considerably below the average in Darjeeling, and this may have influenced the flowering of the kibu. Possibly a similar deficiency of rainfall may have caused the máling bamboo to flower in Sikkim, but it is remarkable that this bamboo did not flower in the Darjeeling forests.

As regards the flowering of Gopi, it must be admitted that the Darjeeling rainfall of 1873 (77·16 inches) was very deficient, the spring of 1874 was dry, and the July rainfall, 14·71 inches only.

The flowering of the nibha bamboo at the end of 1871 cannot be accounted for by drought in that or in the preceding year. It is also difficult to establish any connection between the weather and the flowering of the nigala bamboo. It were strange that where so many kinds of bamboos are found, the weather should cause the flowering of some and not of all.

It may possibly be found that the weather has some effect on the seeding of búk. Observations might be made to establish the connection, if any.

Excessive or deficient rainfall.

39. Very heavy rain sometimes does damage by causing landships or the occasional uprooting of trees; but on the whole such damage is not important. The denudation of the soil is more serious, but may be guarded against by maintaining a constant covering forest growth.

Temperature.

40. For particulars regarding temperature at different seasons, see Appendix I. The following table is taken from Blanford's "Climates and Weather of India, 1889," page 18:—

Station.	Elevation in feet.	Mean temperature of—			Mean highest reading.	Mean lowest reading.	Annual range.	Rise, January to May.	Change, May to July.
		Year.	Hottest month.	Coolest month.					
Darjeeling ...	7,421	51°	61°	40°	72°	25°	47°	14°	+7°

	Old Observatory, (6,912 feet).		New Observatory (7,421 feet).	
Mean highest temperature of year	78°			72°
„ lowest „ „	30°			25°
„ annual range of temperature	48°			47°
Highest recorded reading (12 years)	84·2°	(1877)	(5 years)	72·1°
Lowest „ „ „	26°	(1874)	„	19·9°
Absolute range of temperature	58·2°			52·2°

(*Blanford, page* 294.)

It must be borne in mind that the statistics in the first of the above statements refer to an exposed ridge at 7,421 feet elevation. The extremes are moderate. The hottest time of the year is generally about May or before the burst of the summer monsoon. The normal daily range of temperature is less from June to September inclusive (that is, during the rains), than at any other season. The lowest minimum temperature is generally attained in February, but January is on the whole the coldest month, as the normal mean daily maximum temperature is lower in that month than in December or February, and the normal daily range in January is more than 2 degrees less.

41. The Darjeeling forests doubtless have a great variety of climates, extending as they do over a great range of hills, varying in altitude from 4,000 to 8,600 feet, with some parts directly exposed to the monsoon winds, whilst others are more or less sheltered. It will therefore be interesting to give the following table which realates to Mongpoo (elevation about 3,000 feet), the head-quarter of the Government Cinchona Plantations, situated in a side valley of the Tista river, east of the Senchal range. The climates of the Darjeeling forests are probably intermediate between those of Mongpoo and Darjeeling station.

TEMPERATURE AND RAINFALL OF MUNGPOO CINCHONA GARDEN.

(*Taken from Blanford's Climates and Weather of India, page* 111).

	Average of 8 years' temperature.					Average of 13 years' rainfall.	
	Mean.	Mean Maximum.	Mean Minimum.	Mean range. Daily.	Mean range. Month.	Inches.	Days.
January	54°	59°	49°	10°	17°	0·8	2
February	55°	60°	50°	10°	23°	0 8	3
March	63°	69°	57°	12°	25°	2 1	6
April	68°	73°	62°	11°	21°	4·0	9
May	69°	73°	64°	9°	21°	9 2	17
June	72°	75°	68°	7°	17°	29·9	22
July	73°	78°	69°	9°	14°	31·2	25
August	72°	76°	68°	8°	15°	26·0	24
September	72°	76°	67°	9°	17°	16·5	16
October	68°	72°	63°	9°	19°	5·3	7
November	61°	67°	55°	12°	19°	0·1	1
December	55°	60°	49°	11°	18°	0·2	1
Year	65°	...	...	...	...	125 9	133

Mean highest temperature of year	...	..	83°	
„ lowest „ „	...	...	43°	
Mean range of „ „	...	...	40°	
Highest recorded reading	...	...	88·6°	
Lowest „ „	...	...	40·5°	
Absolute range ...	...	...	43 1°	
Rainfall of wettest year	...	...	155·8	inches.
„ driest „	...	...	92·	„
Rainy days in wettest year	...	...	156	
„ driest „	...	...	116	

Frost.

42. Hoar-frost is very frequent from December to the early days of March. Hard or prolonged frosts are comparatively rare; and it is doubtful whether frosts ever occur so late as to do any damage to vegetation. Seeds of arupati (*Prunus nepalensis*, Ser.) have been found germinating in February even when hoar-frost was frequent. A certain amount of good is done by the frost pulverising the clayey soil, and no doubt it assists in disintegrating the rock.

Snow.

43. Once or twice in the year there is generally a fall of snow. It seldom lies more than a few hours, except perhaps on the higher parts of the Senchal range, in spots sheltered from the sun; and here it does good by melting gradually and helping, in the interval between the end of the rains and the next summer monsoon, to feed the springs which supply Darjeeling with water; but, occasionally, as in February 1887, it lies for three weeks and more. There was a severe snow-storm in Darjeeling on the 27th January 1883, which is said to have done considerable damage to the plantations. The snow lay on the ground for about ten days; a number of seedlings died, more especially tún (*Cedrela Toona*, Roxb.); and in the forests many trees had their branches broken by the weight of the snow. The tún would seem to have been planted at too high an elevation. There is no record in the Annual Progress Report of any damage having been done in February 1887.

Hail.

44. Hail falls occasionally during the spring thunder-storms, and does much damage if it falls when the oaks and other valuable trees are in flower. As with snow, the gradual melting of the hail is beneficial. On tea-gardens hail often does great damage, stripping the leaves off the bushes and bruising the bark: the outturn of tea may thus be reduced considerably. Less fuel is then used for manufacture, and thus the hail may diminish the revenue from this source.

Humidity.

45. This is the special characteristic of the local climate. "Darjeeling is nearly the dampest station at which an Observatory exists" (Blanford, page 51). The mean annual humidity of the Sikkim Himalaya is about 84 per cent. of saturation. Sir D. Brandis, in paragraph 43 of his "Suggestions," remarks that "the higher hills of the Darjeeling district may be regarded as an instance in which excessive moisture causes the trees to grow slowly and natural reproduction to be uncertain." This is perhaps the case for the higher hills of the tract to which this report specially relates, but it seems probable that the climate of the Singalilà range may be less moist.

March is the driest month; in April and May clouds drift up from the plains, and during the summer the air is almost saturated with moisture.

Mr. Chester, who was in charge of these forests for several years, states that "parts of the forest—more especially those with a southern aspect—are enveloped in mist for more than half the year." The humidity is favourable to transplants; the herbaceous vegetation rarely becomes dangerously dry and inflammable, and the ground is frequently moistened by the drip from the trees even when there is no rain. Dew is also heavy.

As a consequence of the damp in most parts of the forest, the stems and branches of the trees are thickly clothed with moss which, in exceptionally dry seasons, adds greatly to the danger of fire. In addition to moss, great masses of orchids, vaccinium, and numerous other epiphytes which load the branches and cover the stems of the trees, are the result of this excessive moisture. It seems not unlikely that the irregular condition of the forest and the stagnation of the air in the under-growth may favour the development of these epiphytes, which, it is hoped, may be diminished when the forest is brought into a more regular condition. For table of Humidity see Appendix I.

Cloud.

46. The quotation from Sir D. Brandis' "Suggestions," given above, refers to cloud as well as moisture. Perhaps the trees might grow quicker if they received more sunshine; but the number of hours of bright sunshine which they actually receive is probably much greater than obtains in the climate of England and Scotland; and when the atmosphere of Darjeeling is clear the light is very intense. The clouds, it must be remembered, do not cover the sky entirely, and

do not remain stationary, though on account of the mist which often envelops the hill tops, one is apt to overlook the fact that they receive a great deal of sunlight at intervals. However it may be, we can do nothing to diminish the amount of cloud, and in spite of it the trees grow at a fair rate and attain, a very large size. They blossom and ripen their fruit perfectly, and the reproduction of almost every species except buk (*Quercus lamellosa*, Smith.), even above 7,500 feet, is satisfactory. Seedlings of maple and kawla (*Machilus odoratissima*, Nees.) are very common; Singori-katus (*Quercus pachyphylla*, Kurz.), rhododendron (*R. grande*, Wight.) arupati, and several other species come up readily, even on the highest ridges. For table of cloud see Appendix I.

Wind.

47. Violent or even strong and steady winds are exceptional. Trees are occasionally blown down, but as often as not their fall is due to the decayed state of the tree or the saturation of the soil by excessive rain. A little more wind would even be an advantage in damp weather to dissipate the mist which makes these forests so dark and gloomy.

Mr. Pedler has kindly furnished the following information: "At Darjeeling the wind is generally rather unsteady. On the average of the year there is an excess of air movement from W.S.W. to W.N.W. Winds remain more or less westerly until the end of May or early in June, but the preponderance of the easterly component of wind in the latter half or two-thirds of June, *i.e.*, with the setting in of the rains in Bengal, makes the resultant an easterly one, and at the same time reduces the percentage of the resultant direction. In July the westerly component of the wind vanishes on the full establishment of the easterly current. The easterly component is again almost neutralized in October and the westerly element predominates from November to the end of the year." For table of wind velocity see Appendix I.

Rainfall on tea estates in the neighbourhood of the forests.

48. The tables of rainfall on tea estates in the neighbourhood of the forest tract (see Appendix I) seem to show how some parts of the hills are more sheltered than others, and may explain the fact that the eastern slopes are generally steeper than the western* (particularly on the Senchal-Mahaldaram range) and the northern slopes steeper than the southern (notably on the Goompahar range). On the east of Senchal-Mahaldaram range, however, the southern face of several spurs would seem to receive a heavier rainfall than the northern slopes. Thus very steep slopes occur with a southern aspect; for instance, at the head of the Mahananda valley east of Mahaldaram, at the head of the Reaing valley on the Sureil spur, and at the head of the Rangjo valley on the southern face of the Tungbu range. If we consider the rainfall of the month of July when the easterly current of the monsoon wind is well established, we note the following striking contrasts between the east and west of the Senchal-Mahaldaram range, south of the Goompahar range:—

* Note.—This holds good also for the Jalapahar-Darjeeling spur.

EAST OF RIDGE.				WEST OF RIDGE.			
Situation of Locality.	July Rainfall.			Situation of Locality.	July Rainfall.		
	Lowest	Highest	Average.		Lowest.	Highest.	Average
Outer hills, most exposed in the Mahananda valley, which trends outh eastward—Gumti Tea Estate (elevation 4,250 feet) (six years)	35·78	130 45	70·65	West of Mahaldaram (elevation 6,700 feet) and of the sources of the Mahananda river:— Eden Vale Tea Estate (5,500 feet) (seven years)	25·24	84 24	51·97
Inner valleys, west of Tista river, sheltered on south by the Mahaldaram Sitong ridge, elevation 5,000 to 6,000 feet, *i.e.*, by the watershed of the Mahananda river:				Gyreegong Tea Estate (5,500 feet) (seven years) ..	29·99	80·25	55 01
Poomong Tea Estate (3,700 feet) (six years) ...	25 92	81·12	49 78	Inner valleys—Sheltered by Senchal mountain, 8,600 feet, Dooteria Tea Estate (5,000 feet) (seven years) .	12 76	48·22	29 76
Rungli-Rungliot Tea Estate (4,250 feet) (five years)	26·88	78·28	48·34	Further west and sheltered by the Nagri spur. Sungma Tea Estate (4,457 feet) (ten years) ...	10·14	44·14	22 60

We have few observations for the tract of country north of the Goom Senchal, and Tungbu ranges, but it would seem that the rainfall on the north of the Goom range increases somewhat from east to west. This may be due

to an in-draught of moisture by the Manibanjan saddle (6,510 feet) and to the barrier opposed to the easterly current by the great Singalilà range. However this may be, proceeding from east to west our records show:—

Situation of Locality.	July Rainfall.		
	Lowest.	Highest.	Average.
Lopchu Tea Estate (4,270 feet) sheltered on the east by Mangwa, Hoom, and Pashok spurs (five years) ...	13·34	50·29	31·95
Darjeeling (7,421 feet) on ridge (ten years)	18·20	58·27	34·50
Bloomfield (5,900 feet) in valley below and west of Jalapahar (seven years) ..	17·53	63·60	37·67
Mim Tea Estate, east of Chongtong spur (6,000 feet) (ten years) ...	25·28	62·10	38·29

CHAPTER VIII.

GENERAL DESCRIPTION OF THE FOREST CROP.

Composition of the crop.

49. The forest is fairly uniform in character throughout the tract. The moisture of the climate, which is its distinguishing element, does not vary sufficiently from place to place to cause any marked difference of character. Accordingly, with the exception of some patches of second growth forest, due to clearings, whatever variety does occur in the composition of the forest crop depends mainly upon elevation.

The large number of useful species.

As regards the stock, the chief peculiarity is the extremely large number of different species of timber trees as well as small trees special to the undergrowth. Of the trees which grow to large size, certain kinds are characteristic of the highest elevation, whilst a few, such as Acer villosum, *Wall.* and mowa (*Engelhardtia spicata*, Blume.) ascend but a few hundred feet from the lower limit of the tract. Others, such as gobria (*Echinocarpus dasycarpus*, Bth.), lepcha kawla (*Phœbe attenuata*, Nees.), tarsing (*Beilschmiedia sikkimensis*, King.), hill chilauni (*Nyssa sessiliflora*, Hook. f.), barkholi (*Casearia glomerata*, Roxb.), &c., have a higher range, but are still generally confined to the lower zone. Between the two extremes, and mingling with both, numerous species are met with which characterise the forest as a whole.

Oaks, chestnut, and champ, the most important timber trees.

The most important of these are, undoubtedly, the oaks, chestnuts, and champ (*Michelia excelsa*, Blume). The last-named was probably better represented formerly than it is now. It is the most generally useful timber, and has been extensively cut out.

Abundance of Lauraceæ and maples.

Owing to the concentration of the demand on the more valuable species, the maples and laurels appear in undue proportion. This result has doubtless to some extent also been brought about by the superior facility with which the maples and laurels reproduce themselves.

Auxiliary species.

Besides the species mentioned, there are numerous others which yield serviceable timber, but cannot be said to alter materially the character of the forest, which has been described as upper-hill mixed forest. Again, walnut (*Juglans regia*, Linn.), pipli (*Bucklandia populnea*, Br.) and tún, though extremely valuable as timber, are now so scarce as hardly to merit consideration as regards the composition of the forest. (*See* page 68 statement of sale of green trees, and Appendix VII.) It appears from the old records that these three species were extensively felled formerly; tún in particular having been cut, in the lower parts of the tract, for tea box planking.

50. The crop is almost everywhere irregular, in some parts consisting of a confused mixture of trees of different ages and varying height; in others presenting the appearance of a two-storied high-forest, the trees of the upper storey being of nearly uniform height, but of different girths, the lower storey composed of saplings and small poles of kharáni (*Symplocos spp.*), kawla, paieli (*Litsæa elongata*, Wall.), sisi (*Lindera pulcherrima*, Benth.), láli (*Prunus acuminata*, Wall.), tháli (*Turpinia pomifera*, DC.), and numerous other shade-bearing species.

Irregular state of the crop.

The forest is remarkable for the great number of very large trees, of from 12 to 20 feet in girth, with large spreading crowns, chiefly oaks and chestnuts, together with some maples, laurels, champ, gobria, dabdabi (*Meliosma Wallichii*, Planch.), and other species. These large trees are in great proportion (estimated at 75 per cent.), over-mature, and very many quite hollow. A large number of the smaller trees are also unsound (see Appendix VIII). As a rule, the best forest is found on ridges or spurs; the trees in the valleys or hollows being generally of inferior species with a larger proportion of shade-bearing kinds, whereas oaks and chestnuts are more abundant on the ridges.

Large proportion of over-mature trees.

51. A list of the trees most characteristic of the various elevations is given in Appendix II. It includes very few of the small trees and shrubs characteristic of the undergrowth, which is described in the next paragraph, but a more complete account of the flora will be found in the same appendix.

Composition of the forest at different elevations.

52. The undergrowth contains a diversity of species fully as great as the upper storey; but, without going into details regarding their distribution, it may be explained that near the top of the principal ridges, and on large spurs, such as those extending to Rangbi and Sureil, máling bamboo (*Arundinaria racemosa*, Munro.) is found, which is very valuable for fodder. It is generally mixed with ásári (*Viburnum erubescens*, Wall., and other species), básak, *Dichroa febrifuga*, Lour.), and other bushes. Generally below the bamboo, but in places mingling with it, a dense growth of kibu (*Strobilanthes pectinatus*, T. And.) existed previous to the autumn of 1890, when this plant seeded and died. It was commonest on the northern and eastern slopes. It is a woody plant, growing to a height of 6 to 8 feet, and with stems up to 3 inches in diameter. Its cover seems to be useful in keeping down the more troublesome weeds. Many kawla seedlings were found under it, and are coming on now that the kibu is dead, together with seedlings of other kinds (notably maple), which appear to have sprung up from the seed of 1890. In an interesting note on the genus Strobilanthes in the *Indian Forester* of April 1888, Mr. Gamble gives some data regarding the use and yield of a dense undergrowth of Strobilanthes in the Lamb's Rock Forest in the Nilgiris.

The undergrowth.

About 6,500 to 7,500 feet, and especially in the better stocked parts of the forest, a lower storey is very common where the soil is particularly good and the trees are lofty. It is mostly composed of shade-bearing species, notably kharáni and kawla, together with láli, barkholi, titey-champ (*Michelia Cathcartii*, Hk. f. and T.), &c. The sweet-scented *Daphne cannabina*, Wall. (from the fibre of which paper is made in Nepal) is also characteristic in localities where the soil is rich and constantly moist. Where the forest is rather open jhingni, maple, and other kinds which require more light, become conspicuous, and saplings of oak and champ are occasionally met with. Barkholi, like maple, seems able when young to grow equally well under a certain degree of cover and in the open; it is generally found at comparatively low elevations. Phota (*Brassaiopsis spp.*), dudhila (*Ficus spp.*), kanakpa (*Evodia fraxinifolia*. Hook. f.), tháli, chindia (*Macropanax orcophilum*, Miq.), as well as numerous other inferior species, grouped in the enumeration tables as "unclassed" or "others," are mostly found in damp places where light is admitted and the growth of woods most rank. In such places the gopi bamboo is occasionally found at low elevations.

Kharáni.

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* Mr. Gamble, in an article on the Darjeeling forests, published in the *Indian Forester* of October 1875 (Vol I, p. 95, says—

"Of the standing trees of any size, fully ⅓ths are long past maturity, while another ⅓ths are younger trees of almost useless timber."

Bagboki (*Sambucus javanica*, Blume.), bogoti (*Hydrangea robusta*, Hk. f. and Th.), and the trailing herb (*Streptolirion volubile*) are common in wet places. The unclassed species above named are also very frequently met with on stony ground, in ravines and water-courses, where better kinds are rarely found.

53. Where the crop is most irregular the forest consists partly of trees with low-spreading crowns, partly of trees with hardly any crowns at all. Frequent openings or small blanks then occur, the undergrowth having little the appearance of a distinct lower storey. The stock in this case consists of a confused mass of trees of all ages, mostly of inferior species, alternating with bushes, such as ásári and básak, and dense thickets of brambles, polygonum, &c. The transition is often gradual from this description of forest to second-growth forest, scrub, and grassy blanks.

Unpromising appearance of the crop as a whole.

54. The present condition of the forest, speaking generally, is over-mature. Material is superabundant, but much of it is of bad quality and rapidly deteriorating. The forest is being invaded by inferior species better capable of withstanding shade, or of more vigorous growth than the valuable kinds, of which saplings and poles are rare and generally have a suppressed appearance. Again, many of the poles and middle-sized trees of all species look as if they had been more or less suppressed when young. Their poor tops may no doubt in some cases be due to breakage by snow or wind, the action of which is intensified by the great weight of creepers, orchids and other epiphytic growth with which the trees are burdened. In other instances the fall of neighbouring trees, or the former practice of lopping, or fires, or, as on southern aspects, the scorching action of the sun may account for the undeveloped appearance of the crowns. In the Dooteria block, where several champ and other trees have been left isolated, the growth of branches on the stem has evidently conduced to trees becoming stagheaded. The unsatisfactory condition of the trees is, however, so general that it can hardly be accounted for by any of these causes alone, and must for the most part be attributed to the natural struggle for existence in a crowded forest, which we find still in operation.

Large proportion of oak and chestnut amongst the large trees.

55. The relative abundance of oak and chestnut among the older trees is partly explained by the greater longevity of these species, as will be shown further on (see paragraph 61); but if they had not formerly enjoyed conditions suited to their development, they could hardly have grown up in such numbers and have formed so many magnificent trees as we know have existed, and of which we still have many noble examples.

The forests already over-mature when reserved.

56. There is ample evidence, in the old Annual Progress Reports that these forests were already over-mature when they came into the possession of the Forest Department nearly thirty years ago. They have not only deteriorated by lapse of time, but the system of selling timber at a fixed price per tree has contributed to the same result. The correct system to have followed, had it been feasible, would, of course, have been to remove the unsound trees and leave those which were flourishing and full of promise. A proposal to this effect was made by Lieutenant Stenhouse, Officiating Conservator, and approved by Government in 1868-69 (*vide* Resolution on the Annual Progress Report for that year, paragraph 5), but does not seem to have been acted upon. Exactly the opposite course was pursued, so that in the more accessible blocks it is now rare to see a large-sized tree of the best species (oaks, chestnuts and magnolias), with a well-developed crown, well grown and full of promise: even medium-sized trees of this description are not very common.

It will be seen, on referring to the percentage in the tables of enumeration of stock (Appendix VII) that the trees of 12½ feet girth (4 feet diameter), generally outnumber those of 11 feet girth (3½ feet diameter). This circumstance likewise is particularly noticeable as regards oaks and chestnuts, and a few other trees which attain such dimensions and are in demand for timber. It is not always the case with champ. This is probably due to the fact that champ remains sound to a larger size than oak and chestnut. This state of things further bears out the assertion which has been frequently made in official reports, that under the permit system purchasers

select the largest and finest of the sound trees, so that the defective trees have been accumulating on our hands.

Condition of the forests in 1867-68.

57. It will be useful to make a few quotations to show what was the condition of the forests when they were first reserved. In the Annual Report for 1867-68 the following remarks occur:—

"The most valuable woods found in the temperate forests are chestnut, magnolia and oak, viz., *Quercus lamellosa*, and two other species. These trees are generally 12 and 14 feet girth; they form one-fifth of the whole of the trees in the forest. The tracts in which they grow are very damp, and the trees are all covered with orchids and creepers of various kinds. The proportion of second and third class trees is limited,* and natural reproduction of seedlings forms but a very small percentage—not more than ten per cent.—of the valuable trees."

Mr. Mann, in his Annual Plan of Operations for 1868, proposed to raise *Michelia excelsa* and chestnut in nurseries as being certainly the most valuable timber trees and those becoming scarce. He says:—"They do not seem capable of reproducing themselves, as their seedlings are smothered by the rank undergrowth of these forests."

In the Annual Report for 1868-69 the scarcity of seedlings was again noticed and the opinion formed that planting would be necessary for the regeneration of the forests. Thus:—

"The proportion of fourth-class trees or saplings of oak, chestnuts and magnolia * * is at present estimated at not more than ten per cent. of the number of trees of other classes in the forest. This paucity of seedlings is no doubt greatly due to the mature state and dense shade of the greater part of these forests; but it also shows that it would not be advisable to depend upon natural reproduction alone for their permanent maintenance."

Description of the forests in 1871-72.

58. In an appendix of the Annual Report for 1871-72 a short description of each of the forest tracts in British Sikkim is given. With reference to the Mahaldaram forest tract, extending from Jorbungalow to Kurseong, we are informed that it was well stocked with timber of kinds—magnolias, oaks, chestnuts, &c., some being fully mature and unlikely to improve; also that the oaks outnumbered all the other kinds.

Types of forest.

59. It has already been explained that the transition is gradual from the prevailing type of forest found about the mean elevation to a somewhat different set of species on the highest ranges on the one hand, and near the lower edge of the tract on the other, but that distinct zones do not exist. Oaks are represented by some species at all elevations, and so are the magnolias, laurels and maples; but their relative proportion in the crop is less both at higher and lower elevations.

Mallota and scrub forest.—A distinctive though transitional type of forest is found in several places and generally on land formerly under cultivation. It consists of an upper storey of almost pure mallota (*Macaranga denticulata*, Muell.), beneath which scrub growth is usually found, containing a number of species peculiar to second-growth forest, with a sprinkling of seedlings and saplings of the species normally composing the forest at the same elevation. This mallota forest very often occupies rocky or stony ground, whilst grassy slopes with a more or less clayey soil seem less suitable for mallota, and are generally dotted with scrub growth of bilauni, jhingni (*Eurya spp*), kharáni, gurupis (*Leucosceptrum canum*, Sm.), bokay timur (*Zanthoxylum acanthopodium*, DC.), kanakpa, dudila, titapát (*Artemisia vulgaris*, Linn.), brambles (generally *Rubus ellipticus*), a kind of bracken fern, *Osbeckia* (generally *O. crinita*) and creepers, including manjit (*Rubia cordifolia*, Linn.) Gurupis is in some places almost pure.

Cane-brakes in some places occupy a few acres, *e.g.*, in the Tasiding Circle, and in the Rangbi, Rishap, Sureil, Mámrim, and Poomong blocks. Cane is

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* The classes seem to have been—

	IV.	III.	II.	I
Girth in feet ...	1½	3	4½	6
Equivalent diameter ...	6"	1	1½'	2.

5966

most common at northerly and easterly aspects. The better kinds have been rooted up for walking sticks. The waste thus occasioned and the almost total extermination of one of the most valuable species used for suspension bridges in the hills—*Calamus montanus*, Müller.—was noticed by Dr. Anderson in paragraph 5 of the Annual Progress Report for 1866-67.

The *alder* (*Alnus nepalensis*, Don.) is plentiful in some places, *e.g.*, in the Sureil block, but can hardly be said to constitute a separate type of forest.

The principal species and their relative proportion.

60. The principal species have been mentioned above, and an idea has been given of their relative proportion in the forest crop in former times. The proportion of course varies from place to place, notably according to elevation. It is also modified by human agency as well as by natural causes—at any rate in the more accessible blocks. Thus, in compartment 8 of the Rangbul block, close to Jorbungalow (elevation about 7,500 feet), which was almost entirely cleared during 1877-78 (see Annual Report for that year, paragraph 57 and Annual Report for 1878-79, paragraph 56), the magnolias had entirely disappeared, and the proportion was found to be :—

	Per cent.
Láli	29·3
Booke	17·3
Phalát	13·2
Kawla	10·1
Phaila (Paieli)	8·0
Kabashi	5·0
Katoos	4·8
Bhudrassi	3·2
Kharáni	2·8
Dubdubia	2·1
Doodoola (Dudila ?)	1·5
Mayah	1·4
Sissi	0·8
Jingni	0·4
Lepchaphal	0·1
Total ...	100·0

Grouping the more important species of the above list, it appears that the proportion was as follows; but it is not known to what diameter classes the trees belonged—

	Per cent.
Laurels (láli,* kawla, paieli, sisi, lepchaphal) ...	48·3
Oaks and chestnuts	35·3

61. Owing to the irregular state of the forest, the overworked condition of certain parts, and the varying proportions in which the species are mingled according to elevation, it would be useless and misleading to strike an average of the results obtained in the various sample areas. The tables of enumeration are therefore given in Appendix VII, and in these the relative proportion of the species in each class has been calculated with reference to the total of trees in that class. It is thus shown how the oaks, chestnuts, magnolias, maples, laurels, pipli, and other useful timber trees which grow to large size, are able to hold their own against the hosts of inferior species which so greatly outnumber them in the stage of saplings and small poles. It is clear that the longevity of these large trees is the cause of their eventual preponderance; but they have none the less to sustain a severe competition with the inferior species up to a certain age or diameter class. The laurels are the chief competitors of the oaks, chestnuts, and magnolias, and it is only after the former attain a girth of 9½ feet (3′ diameter) that their proportion is greatly diminished. The maples (especially *Acer Campbellii* and *A. lævigatum*) are sometimes found in increasing proportion above this size, except where the larger trees have been

* NOTE.—Kawla is often called láli, but is distinct from *Prunus acuminata*, the true láli, which is very common in the underwood, and is sometimes distinguished as Singmas láli. Its foliage is used for fodder, whilst that of kawla is not. Some confusion has possibly been made between them.

cut out. Pipli and tún are also capable of outlasting the kawla. Lepcha-kawla and gobria are trees of lower elevation; where they predominate the oaks, chestnuts, and champ are of secondary importance, because below their proper limit.

62. The following table is given as an instance to show how the percentage in each class varies inversely for the principal and inferior species:—

PERCENTAGE OF SPECIES IN SAMPLE AREA IN RANGIRUM BLOCK.

SENCHAL WORKING CIRCLE, BLOCK I.

Elevation, 6,500 to 7,250 feet.

Names of trees or groups of trees.	DIAMETER CLASSES IN FEET.								Total.
	½	1	1½	2	2½	3	3½	4 .	
(i)—Principal trees.									
Oaks and chestnuts	1·50	2·18	3·85	7·35	13 04	26·24	25·52	42 07	3·31
Magnolias	0·16	·50	2·12	4 06	4·76	6·34	6·12	2·91	·77
Laurels	12·79	30·10	35 01	38·89	32 07	26 70	15 30	9 06	18·73
Maples	1·42	1·88	4·57	7 80	11·03	11·77	17 35	18·12	2·66
Pipli	0·06	0·10	0 07	·68	0·75	1·81	4·08	2·27	·13
Total of principal species ...	15 93	34 85	45·62	58·78	61 65	72·86	68·37	74·43	25·65
(ii)—Other timber trees.									
Chilauni, dabdabi, gobria, bhadrasi, arupati, mya, barkholi	3·99	7·58	13·37	15·93	19·31	19·00	21·43	21·69	6·55
(iii)—Inferior species.									
Symplocos, láli, thái, chinda, ficus, jhingni, and unclassed	80·08	57·62	41·01	25·29	19·04	8·14	10·20	3·88	67·80
GRAND TOTAL OF ALL TREES ...	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

NOTE.—The percentage is that of the number of trees of the species or group in each class on the total of that class.

Size at which the principal species are generally mature.

63. The above figures show that it is very misleading to calculate the proportion of a given group of species on the total number counted in the different classes, even if the lowest classes are omitted. It has been found by experience that the large percentage of oaks and chestnuts of 4 feet diameter indicates that these trees are generally unsound when of this size. Sound trees are generally found in the two next lower classes. Safed champ of 4 feet diameter is more often sound than oak of that size. The comparative scarcity of this species is noticeable.

Kawla is generally mature between 2½ and 3 feet in diameter, and the same is generally the case with the other timber trees, (*ii*), except gobria and lepcha kawla, which reach maturity at about 12 and 10 feet girth respectively. (*See also paragraph* 92.)

Abundance of small poles available for removal.

64. The enumeration tables also indicate that vast numbers of small poles of kharáni and other naturally small trees may be obtained from the undergrowth without at all impoverishing the principal growing stock, but, on the contrary, with advantage to the growth of seedlings and saplings of the best species. The yield from thinnings will undoubtedly be very considerable.

Reproduction.

65. It is not to be expected that natural reproduction should be everywhere satisfactory in these forests so long as grazing continues and the state of the stock and the condition of the surface soil remain less favourable than they would be in a properly managed forest. Yet, in spite of these drawbacks, and considering the forests as a whole, reproduction is decidedly good. It could hardly be otherwise in such a climate and with such a great number of species. A certain amount of light, and a soil somewhat loose and fairly free from weeds, seem to be conditions suitable to the growth of seedlings of most good kinds. Only on extensive blanks, covered with turf and open to grazing, and perhaps also on very exposed ridges, where seed-bearing trees are scarce or absent, is there any real difficulty in obtaining natural reproduction. Not counting kanakpa and other inferior

species, which it is not desired to reproduce, seedlings of such kinds as kawla maple, barkholi, sisi, titi champ, arupati, bhadrasi (*Elæocarpus lanceæfolius*, Roxb,) katus, pipli, angéri (*Pieris ovalifolia*, D. Don), rhododendron, &c., are often met with in localities suited to them. Búk and champ seedlings are comparatively scarce, and this is accounted for partly by grazing, partly by the absence of suitable conditions of light, shelter, and soil, by the more rapid growth of inferior species and weeds, and in a certain degree (at any rate in the case of búk) by the less frequent seeding of the parent trees, and as regards champ by the relative scarcity of this tree in many parts of the forest. The búk and singori katus (*Quercus pachyphylla*) have additional disadvantages, viz. that the acorns firmly embedded in their cups are large and not readily covered by the soil. They are very often worm-eaten and, as well as the chestnut (*Castanopsis Hystrix*), are eaten by squirrels and other animals, not to mention man.

Observations by officers in former years on the best means of regenerating the forest.

66. The necessity of shelter for both natural seedlings and transplants has been remarked by several officers who knew these forests well. Para. 77 of the Annual Progress Report for 1883-84 is worth quoting as an example:—"The rigid exclusion of cart cattle from the areas being worked for the fuel supply, alluded to in paragraph 134 of last year's report, has been continued with the result that there is a marked improvement in the condition of these blocks. Natural seedlings of all classes are showing themselves. Those of the better kinds of timber trees are found generally in sheltered positions under bushes or banks, and it may here be remarked that it is in similarly sheltered spots in the regular plantations that seedlings have more often succeeded, while many put out in the open have succumbed to drought and frost."

Numerous other quotations might be made embracing the observations made by different officers during a long term of years. They all tend to show that seedlings of búk and champ, and most of the important species, require shelter when young; that they require more light when they have over-topped the weeds; that clean fellings are inadvisable, as the dense growth of weeds and inferior species smothers the slower growing but more valuable kinds, when cleanings must be repeated frequently at great expense; that champ, oaks, and katus can best be reared in half shade; that dense shade does not suit them, and that they are liable to be smothered under the dense undergrowth of these forests. These are the remarks recorded by Lieutenant Stenhouse, Mr. Mann, Dr. Schlich, Mr. Gamble, Mr. McDonell, and Mr. Chester, and are fully in accord with the observations of the writer of this report. It has also been noticed that the system of planting up blanks and areas clean felled, in lines about twenty feet apart, leaving whatever jungle may exist on the intervening spaces, has given better results than that of clearing away all the jungle and planting closely. The difference has been attributed to the shelter afforded by the belts of jungle situated between the lines. The expense of planting in lines was also much less, although frequent cleanings were still needed to prevent the jungle on either side from closing over the lines and smothering the plants. It was found to be advisable, in the case of slow-growing kinds, to use plants two or three years old.

The system of clean-felling and planting, though tentatively adopted in the most ruined parts of the forest where fuel operations were started, was not intended to be applied in the better stocked parts. Dr. Schlich was careful to mention this at the outset in the following words:—"The Conservator does not wish it to be understood that this mode of reproduction is the one to be adopted generally. On the contrary, when we get to the more regularly stocked areas, it will in all probability be preferable to restock by natural reproduction" (*vide* Annual Report for 1877-78, paragraphs 53 and 54). This opinion was shared by Mr. Gamble, who in paragraph 27 of the Annual Report for 1880-81 wrote thus:—"When blocks which have been less damaged previously to their reservation come to be worked, the Conservator believes that artificial reproduction, except so far as regards the interplanting of a few trees of good kinds where such are scarce, may be discontinued."

Sir D. Brandis' opinion.

Sir D. Brandis considered reproduction to be slow and uncertain, particularly above 7,500 feet. He recognized the necessity of shelter, and stated that it was not intended to make complete clearances anywhere. He also pointed out that even with the

most careful arrangement of cuttings, natural reproduction would not suffice to restock the forest, and that planting must be resorted to.

67. The mode of reproduction of the various species requires study. The following notes concerning the principal species may be useful.

Notes on the mode of reproduction of the more important species.

68. *Búk* (*Quercus lamellosa*, Sm.)—Even in blocks closed to grazing, the scarcity of seedlings, saplings and young poles of this species is striking. Seedlings of the first year are met with, but they seem to die off the same year as a rule. Saplings and small poles, unless there be an opening in the canopy directly overhead, have generally a deformed and suppressed appearance. The reproduction of búk is most satisfactory where the soil is rich and light where there is no grazing, and especially on ridges, or where the forest is open, or the cover particularly lofty. The young plants seem to require protection, and may be found under the shelter of a boulder, stump, or fallen tree, having possibly sprung from acorns left by squirrels or which have escaped their notice. The máling bamboo, which generally grows best on ridges where there is abundant light, and of which the halms retain the fallen leaves, seems to assist the reproduction of búk in places where the bamboo itself is protected from cattle. On the Sureil and Chattakpur ridges facing the east, and on several other spurs to the east of the Senchal range, seedlings and saplings of búk were noticed more than elsewhere. Here there is no grazing; the growth of máling is luxuriant; the ridges are sharp, steep, often rocky and well exposed to sunlight. On the west of the Senchal main ridge, on the other hand, near the summit the ground is rather undulating, the soil is indeed excellent, but the cover is dense and there is a tangled growth of a slender bramble (*Rubus Thomsoni*), among which seedlings of kawla, chimal and an occasional maple or paieli were alone noticed; búk being absent.

Búk can be readily raised from seed in nurseries, but acorns are sometimes not obtainable for a couple of years together.

69. *Phalát* (*Quercus glauca*, Thunb. and *Q. lineata*, Blume). The above general remarks apply. The acorns are smaller than those of búk, are set in shallower cups, thus they drop out more readily and are more easily covered with soil. The seeding of phalát may be good when that of búk is bad: the acorns of the former are perhaps less worm-eaten than those of búk or katus.

70 *Bara katus* or *singori katus* (*Quercus pachyphylla*, Kurz)—Is most common on ridges at Goompahar and Senchal. It fruits perhaps more frequently than búk or phalát. The acorns are generally in masses, three together, imbedded in compact scaly cups, and seem to be set free by the decay of the cups during the rains. Seedlings are fairly numerous in the neighbourhood of the parent trees, though the acorn is eaten by Paharias and Bhutias and is very often unsound.

71. *Katus* (*Castanopsis Hystrix*, A. DC.)—Seedlings are commonest in light soil with a warm aspect, and away from cover. The fruit is eaten.

Coppice shoots of oak and chestnut have been frequently noticed—often from very old stools; but very little is known of the coppicing power of the great majority of the trees which compose these forests. The oaks (búk and phalát), with large medullary rays, which yield the best firewood, are particularly scarce in the younger stages of growth, and are not so common at the lowest elevations as they are higher up.

72. *Magnolias*:—*Lal champ* (*Magnolia Campbellii* Hk. f. & Th.)—The tree itself is scarce and its reproduction rather scanty. Chiefly found about Senchal, it descends to 7,200 feet on northern slopes. The seedlings appear to require light. A few natural seedlings found in the Rangbul plantation were considered by Dr. Schlich to show habits similar to those of acrote (walnut), *i.e.*, thriving well when exposed to the full light of the sun; whereas safed champ, the oaks, and katus seemed to prefer some protection during the first years of their existence and to be best reared in half shade. Lal champ is less important than the following.

73. *Safed champ* (*Michelia excelsa*, Blume.)—Reproduction is plentiful wherever seed falls on good, rich, light soil not too densely occupied by weeds, and sheltered without being closely canopied. Under an interrupted, fairly lofty canopy the seedlings grow well amongst grass and weeds, in the Pagraingbong block for instance. This species produces an abundance of good

seed. The seed is covered with a red, oily arillus, and this seems to protect it. Cattle are, however, very fond of the leaves of this species, as well as of oaks. In blocks open to grazing, therefore, the seedlings have a very poor chance, and are generally either browsed down or pulled up by the roots.

74. *Titi champ* (Michelia Cathcartii, Hk. f. & Th.).—Very common in the Rangirum block and on other parts of the Takdah range; comes up well on paths and banks where a little light is admitted, and even under cover, provided it is not very dense. The saplings grow very straight; the tree seeds well.

75. *Maples.*—All species of maples germinate readily. *Acer Campbellii*, *Acer lævigatum*, and *Acer sikkimense* being common, particularly the first. The last named is frequently epiphytic. They all appear to coppice readily and to enjoy immunity from cattle. The plentiful reproduction of the maples, their generally light cover, and deciduous habit, give them a special sylvicultural importance. As fuel the wood is said to be second only to oak (*vide* Annual Report for 1877-78, paragraphs 49 and 58), although not much valued as timber.

76. *Laurels.*—Of these *kawla* (*Machilus odoratissima*, Nees) is the most important as regards reproduction and the composition of the mature forest. Its seedlings and saplings are found almost everywhere. They grow perhaps better under cover than any other of the principal species; but poles even of this tree have often a suppressed appearance when growing under very dense cover. On a newly-made path, where the soil had been loosened and quite freed from weeds and the canopy partly opened, kawla and lepcha-kawla seedlings have been found to come up thickly. They are also readily raised in nurseries. This species has a wide range; it appears to be hardy, to thrive either under shade or when fully exposed, and is not browsed by cattle. Seeds not obtainable in 1891.

77. *Paieli* (*Litsæa elongata*, Wall.) is the larger kind (*Lindera assamica*, *sanu paieli*, is a common tree of the lower storey); germinates freely and comes up under cover almost as well as kawla.

78. *Sisi* (*Lindera pulcherrima*, Benth.)—Seedlings generally common between 6,000 and 7,000 feet; grows straight, often with several stems; useful to complete the thicket.

79. *Lepcha-kawla* (*Phœbe attenuata*, Nees.) germinates profusely even under low cover, provided the ground is fairly clear of weeds. At low elevations this is a good kind to plant amidst scrub. Seeds often; fruit eaten by bears, and the rind of the fruit by Lepchas, whence the name.

80. *Tarsing* (*Beilschmiedia sikkimensis*, King.)—Seedlings not very common; they grow well under shade, and are occasionally found in grassy blanks; easily raised in nurseries. The tree is generally tall and straight without low branches, and with a cylindrical bole.

81. *Chilauni* (*Nyssa sessiliflora*, Hk. f.)—Raised in a nursery in the open the seedlings came up well; they are not easily distinguished in the jungle; saplings are fairly common in the neighbourhood of the parent trees and under light cover.

82 *Gobria* (*Echinocarpus dasycarpus*, Benth.)—Most common at southern and western aspects, but also found, as at Rungirum, thriving on slopes facing north-west; seeds freely; the seedlings have large leafy cotyledons, and when very young are rather delicate and need some shelter; this species comes up well in a sparse growth of weeds on new clearings.

83. *Barkholi* (*Casearia glomerata*, Roxb.)—A tree often found in second-growth forest; perhaps commonest at warm, sunny aspects, as in Palongdong and Pagraingbong blocks; seedlings plentiful; do well with plenty of light, and also thrive under cover; useful to complete the thicket, and a capital nurse in the restocking of blanks.

84. *Arupati* (*Prunus nepalensis*, Ser.)—The seed germinates very easily; season end of February and early part of March, even when hoar-frost is frequent. The seedlings seem to thrive almost as well under cover as in the open; they are very common and are useful for restocking blanks; the seeds are distributed by birds. The tree has an extensive range, but between 6,000 and 6,500 feet it grows quickly, and sound trees of 8 to 10 feet girth, with fine, straight-tapering boles, are then met with.

85. *Pipli* (*Bucklandia populnea*, Br.)—A valuable timber, but not a common tree; is said to have been cut out in former years. The sale of pipli has

been stopped for some time past, and the species has been extensively propagated by planting. The plants are doing remarkably well in the Rungirum, Dawaipani and Poomong blocks. It comes up naturally on newly-broken ground, such as landslips, where there is usually subsoil moisture, and is found on ridges, *e.g.*, on the Setangbong ridge near Sukia-Pokri and on the Tungbu (Takdah) ridge at Deoral; also on precipitous ground, for instance in the Setikhola between Rangnu and Rangirum blocks (V and I of Senchal Circle); pipli seedlings have also been noticed on moss-grown decayed stumps and on the earth exposed by uprooted trees. The seed is small and thin and widely distributed by wind, but doubtless much is intercepted by the foliage of trees and weeds, so that little reaches the soil except where this is exposed. The young plant grows well in the open places, where it springs up naturally, and then developes many up-growing lateral branches. It will bear shade to a certain extent, but the stem becomes weakly if the plant is much crowded. It may usefully be planted in thin scrub growth between 6,000 and 7,000 feet.

86 *Walnut* (*Juglans regia*, Linn.)—The tree is rare in all stages of growth; its sale is not allowed. In Mr. Mann's Annual Report for 1866-67 this tree was said to have become very scarce in the forests of British Sikkim. In that year 2,600 walnut trees were planted out at an elevation of 5,000 feet near Kurseong. It has been more recently planted at Rangbul and in the Rangnu and Dawaipani blocks, but the success has been small owing to the exuberant vegetation of the surrounding jungle; it succeeds best on slopes with a southern or western aspect. There are several flourishing trees in Darjeeling on the slope in front of the cutcherry at Lowland Place, facing west, and one close to the Forest bungalow at Rangirum. The tree grows well. A few scattered trees have been met with in the Pagraingbong block, but the tree seems to do best in the open. It would probably do well as a standard over coppice.

87. *Tún* (*Cedrela Toona*, Roxb.).—Grows near the lower limit of the tract. Large trees are now scare and seedlings are not very common; the seed is very light and is easily disseminated by the wind; the seedlings are generally found in moist, warm valleys coming up either in the open or under very light cover: the saplings grow very straight and without branches when there is an opening in the canopy overhead. In such case, should the leading shoot be destroyed in any way, as it often is by blight or by a grub which eats away the pith, a new shoot usually grows upward with a sharp bend which is soon effaced by subsequent growth. Young trees growing in the open, on the other hand, become much branched, and rarely yield serviceable timber. Tún is easily raised in nurseries, provided the seed is sown soon after it ripens. The soil should be light, the seed very slightly covered, and the beds should be shaded by trees, or artificially screened from the sun until the plants are a few inches high.

88. *Cryptomeria japonica*, Don.—This tree is quite naturalized in the district, and has been planted successfully at elevations varying from 3,000 to 7,000 feet. It appears to grow best between 5,000 and 6,000 feet; at 7,500 feet on Jalapahar it grows slowly, and the trees have a stunted appearance. This was one of the species raised in the Jalapahar nursery by Dr. Anderson during 1864-65. "The seeds were obtained in the station of Darjeeling from trees that had been raised from seed brought to India by Mr. Fortune on his first mission to China for tea seed. The seeds of the *Cryptomeria japonica* were given by Mr. Fortune to Dr. Falconer, Superintendent of the Botanical Gardens, Calcutta, for distribution in the hill stations. Those sent to Darjeeling have become handsome trees which now bear seed abundantly." The seed ripens in July-August at low elevations, and rather later at Darjeeling; if sown in the cold weather it germinates generally in April or May; the plants should be pricked out in the nursery and be ready for planting out when they are about 18 inches high. Cryptomeria is very quick-growing; succeeds well in the open or with very slight shelter, and will be very useful for restocking blanks and poorly stocked areas at the lower edge of the forest, as cattle will not eat it. In such situations it should be planted closely, say about 5′ × 5′.

Blanks and poorly stocked areas.

89. There are now only two extensive blanks—one about 450 acres in extent along the lower edge of the forest in the Balasan and Palongdong blocks (block I of Posambing

and block V of Nágri Working-Circle, the other is the site of the deserted barracks at Senchal (area about 300 acres) included in the block set apart for grazing. Blanks of small extent, or areas much more poorly stocked than the rest, occur in several periodic blocks. They have been carefully entered on the 2″ stock-map in the field from observations made with a good field-glass, and their area calculated from the map has been given in the area statement as poorly stocked. Where these blanks are at the lower edge of the forest, they are found to correspond very closely with the limits of cultivation shown on the old district map surveyed in seasons 1865 to 1867. The site of the Senchal barracks was probably occupied some years earlier. Thus, although nearly thirty years have elapsed, forest has not grown up on these grassy blanks to any great extent. This is in most cases due to several adverse conditions, namely grazing, unfavourable aspect, the compact and turf-covered surface of the soil, which is generally clayey, and the absence of shelter.

90. Attempts have from time to time been made to plant up such blanks. The experience gained in the Sepoydhura block is described as follows in the Annual Progress Report for 1883-84, paragraph 167:—

"In the Sepoydhura block attempts have been made in successive years to plant up the large blanks which existed, it is understood, before the Department took charge of this forest; but the want of shelter and consequent exposure to heat, drought, and frost have continually killed off the plants put out, a few pipli seedlings being the only survivors.

Natural growth of the hardy and inferior kinds having sprung up in places only, a quantity of seed of the jhingni (*Eurya japonica*), which grows quickly and coppices well, was collected during the cold weather and sown in roughly-made pits in parallel lines through these blanks, and it is proposed, when the plants have attained a sufficient growth, to put out under their shelter seedlings of the better kinds, which have hitherto failed in the open in this block."

The experience of the writer of this report has been similar. In the neighbouring Dhobijhora forest (elevation 6,000 to 6,500 feet), the restocking of blanks, undertaken in 1881-82 by the immediate planting of búk, champ, katus, &c., proved costly and unsuccessful, especially on slopes with a southern aspect. Fully half the plants died; those only grew well which were sheltered in some way, and champ on the whole succeeded better than oak and chestnut. On grassy blanks in the northern part of the forest, with a western and north-western aspect, the plants thrived fairly well at first, especially those which were sheltered.

An experiment has recently been made on a large patch of grass on the ridge towards the south of this forest, with a swampy depression in one part, generally shallow soil, and a southern aspect. Very little spontaneous scrub growth, existed and the plot had been burned more than once. With a view to provide shelter for the future planting of champ, oak, and chestnut, a number of seedlings of hardy kinds, cuttings, and máling bamboo offsets were put out during June 1890; the following being the result in June 1891:—

(*i*) *Seedlings taken from the forest.*

Kharáni	Generally failed.
Paieli (*Litsœa elongata*) ...	Ditto.
Kabashi	Successful.
Barkholi, a few	Failed.
Sisi, ditto	Do.
Jhingni, phalami, and hingua	Very successful.

(*ii*) *Cuttings.*

Toushiari	Failed.
Fullidha (*Erythrina arborescens*, Roxb.)	An utter failure.
Gurupis	Successful.
Asári	A partial success.
Baish (weeping willow) ..	Successful even on ridge.
Látikát (*Glochidion acuminatum*, Muell.)	One or two only alive.
Gogen (*Saurauja napaulensis*, DC.)	Failed.
Bhalayo	Do.
Kharáni	Do.
Dudhila	Do.
Nibari (*Ficus Roxburghii*, Wall.)	Do.
Arupati	Do.
(*iii*) *Off-sets* of máling bamboo	Very successful.

Nursery plants of champ, búk, and a few pipli planted under shelter of the few scattered bushes have uniformly done well.

List of plants, giving size attained by the principal trees.

91. In the list of plants in Appendix II the dimensions in feet attained by the most important species in total height, height of bole, and in girth have been given according to the formula used by Mr. Gamble in his "List of trees, shrubs, and large climbers found in the Darjeeling district, 1878." This work is now out of print, and in it many of the plants were given under doubtful or wrong names. A new list has been drawn up, referring only to the tract dealt with in this report, to which it forms an appendix (Appendix II). This list has been carefully compiled by Mr. Haines, who has entered many of the smaller plants common in the undergrowth which did not come within the scope of Mr. Gamble's list. The new list has been carefully collated, and the names are in accordance with the nomenclature of "*The Flora of British India*," so far as it has been published.

Marketable dimensions attained by the more important timber trees.

92. In order to ascertain the *marketable* size of the different kinds of timber trees, the trees removed by purchasers have been classed in the groups adopted for the enumeration of stock, and the table on page 30 shows the number and percentage of trees of different sizes sold during the five years 1886—91; the girth having been measured (at four feet from the ground) since the system was introduced of charging 10 per cent. extra for excess girth over a certain size.

It appears that 9 feet girth was the size most in demand, indicating that at these dimensions the trees combine the largest volume of timber with soundness of quality. Thus in the Singalilà forest comparatively few trees of 8 feet in girth and under have been sold.

In the tract to which this report more especially relates, however, a large proportion of the trees sold are under 9 feet in girth; the largest proportion, 22 per cent. of the total, being of 8 feet girth. This is particularly the case with trees of the laurel family, chilauni, and the maples, though even of these kinds a large number of trees of 9 and 10 feet girth are still sold. Though sound trees of large size are now scarce in the nearer blocks, the recent extension of the Goompahar cart-road has enabled supplies of timber to be drawn from blocks which were formerly but little worked. In fact, if the average dimensions of the trees sold is less in the tract referred to than in the case of the Singalilà forest, the cause is to be attributed to the circumstance of the former area having been more intensely worked.

The kinds of timber most in demand are the oaks (búk and phalát), champ, the laurels, and katus. The proportion of these kinds to the total number of green trees sold during the ten years 1880—90 was as follows:—

	Per cent.
Búk and phalát	28·5
Champ	23·3
Kawla and other laurels	22·3
Katus	9·5
	83·6
Other kinds	16·4
Total ...	100

Champ has, however, headed the list of late years. Gobria appears to be most in demand between 12 feet and 17 feet in girth, but the number sold is small. It is known to remain sound up to a great size, but has large buttresses, which interfere with the measurement of the true girth and deter purchasers from buying the tree according to measurement at 4 feet from the ground.

GREEN TREES REMOVED BY PURCHASERS.

1886 to 1891.

NOTE.—*This table is intended to show the dimensions most in request.*

Species.		Girth in feet.																Total (5 years).	Average (5 years).
		6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
Champ ...	No.	...	17	64	93	82	53	39	31	21	11	7	2	4	1	...	2	427	85·4
	%	.	4	15	22	19	12	9	7	5	3	2	·5	1	...	...	·5		
Búk and phalát ...	No.	.	21	55	100	106	55	44	18	14	5	9	3	..	..	..	...	430	86·0
	%	...	5	13	23	25	13	10	4	3	1	2	1	...	..	...	..		
Katus ...	No.	...	12	16	29	30	18	19	13	4	4	4	3	..	.	1	...	153	30·6
	%	.	8	10	19	20	12	12	8	3	3	2	2	.	.	1	...		
Maple ...	No.	.	3	6	6	4	2	...	...	...	...	..	..	.	...	...	...	21	4·2
	%	.	14	29	29	19	9	...	...	...	...	.	...	.	..	...	..		
Kawla and other laurels ...	No.	2	29	142	63	47	13	10	5	...	1	2	...	1	...	...	..	315	63·0
	%	1	9	45	20	15	4	3	2	...	...	1	...	..	..	...	..		
Chilauni ...	No.	1	5	25	7	10	5	3	...	...	1	1	.	..	.	...	...	58	11·6
	%	2	9	43	12	17	8	5	...	...	2	2	..	..	...	...	...		
Gobria ...	No.	...	...	3	...	2	...	3	2	4	2	3	3	1	...	...	1	24	4·8
	%	..	...	12	...	8	...	13	8	17	8	13	13	4	...	...	4		
Other kinds	No.	1	5	9	5	7	3	...	...	2	...	1	3	1	...	1	...	38	7·6
	%	3	13	24	13	18	8	...	...	5	...	2	8	3	...	3	..		
Total ...	No.	4	92	320	303	288	149	118	69	45	24	27	14	7	1	2	3	1,466	293·2
	%	...	6	22	21	20	10	8	5	3	2	2	1	...	.	.	.		

Singalilá.

Champ ...	No.	...	14	6	29	16	16	5	5	3	1	.	.	..	..	1	...	96	19·2
	%	..	15	6	30	17	17	5	5	3	1	...	...	...	...	1	...		
Búk and phalát ...	No.	..	...	1	...	3	2	6	...	1	...	...	...	...	...	...	...	13	2·6
	%	...	...	8	...	23	15	46	...	8	...	...	..	..	...	...	...		
Katus ...	No.	..	...	...	..	3	2	3	3	1	...	1	...	...	...	...	...	13	2·6
	%	...	...	...	...	23	15	23	23	8	...	8	...	..	...	..	...		
Kawla ...	No.	..	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	3	·6
	%	..	33	33	34	...	...	...	...	...	...	...	...	..	..	...	...		
Total ...	No.	...	15	8	30	22	20	14	8	5	1	1	..	...	...	1	...	125	25·0
	%	...	12	6	24	18	16	11	6	4	1	1	...	...	...	1	...		

93. The following table has been compiled from the figures recorded in the annual reports since 1883-84 to show the volume of trees actually measured, which were removed by purchasers:—

Cubic contents of trees removed by purchasers.

Species.	No. of Trees.	Average Volume in c.ft.			Percentage.		Remarks
		Timber.	Fuel.	Total.	Timber.	Fuel.	
Búk ...	28	235	106	341	69	31	
Do. ...	7	...	411	411	...	100	Firewood only.
Phalát ..	3	108	47	155	70	30	
Katus ...	4	570	70	640	89	11	
Champ ...	22	189	119	308	61	39	
Kabashi ...	8	156	64	220	71	29	
Do. ...	1	...	333	333	...	100	Ditto.
Kawla ...	18	146	91	237	62	38	
Tarsing ...	2	206	58	264	78	22	
Chilauni ...	4	122	49	171	71	29	
Gobria ...	3	341	89	430	79	21	
Bhadrasi ...	5	98	68	166	59	41	
Utis ...	1	60	35	95	63	37	
Walnut ...	1	231	26	257	90	10	
Angaria ...	1	565	175	740	76	24	
Do. ...	1	314	51	365	86	14	Kurseong Division.
Tún ...	6	266	137	403	66	34	
Mowa ...	5	470	64	534	88	12	

These figures are sufficient to show that the factor, 250 cubic feet per tree, which has been adopted in estimating the outturn of timber removed by purchasers, is well within the mark.

CHAPTER IX.

THE PAST SYSTEM OF MANAGEMENT.

94. During the first few years of forest conservancy in Bengal, which was inaugurated by the appointment of Dr. T. Anderson as Conservator of Forests in August 1864, little demand was made on the forests by the general public, supplies being drawn from private estates and, as far as Darjeeling was concerned, from the Goompahar forests, which were then owned by the Municipality, though subject to the general supervision of the Conservator.

Introduction of forest conservancy.

Already in 1865-66 it was recorded that the forests within five or six miles of Darjeeling had been almost completely cleared of trees fit for timber, that reckless waste prevailed, and that valuable timber trees were indiscriminately cut for firewood along with the inferior species.

The only reserved forests in Bengal at this time were those of the Darjeeling Hill Territory (British Sikkim), 15½ square miles in extent, mostly situated on the main Senchal range between Jorbungalow and Kurseong.

95. At the outset the forests were worked by government agency.

System of management first adopted.

Rates were also fixed for the sale of trees in small numbers as follows:—

	Rates per tree above 7 feet girth.
(i) First-class reserved trees.	Rs.
1. White magnolia, champ (*Michelia excelsa*) ...	10
2. Red „ „ (*Magnolia Campbellii*) ...	8
3. Chestnut, katoos (*Castanea sp.*)	10
4. Oak, booke (*Quercus lamellosa*)	8
5. Walnut, acrote (*Juglans regia*)	15
(ii) Second-class reserved trees.	
6. Oak, badjirat (*Quercus sp.*)	6
7. Chalauni (*Gordonia sp.*)	6
8. Cherry, puddum (*Cerasus Puddum*)	4
9. Lali (*Phoebe sp.*)	4

(*See* Forest Rules for British Sikkim, Rule VI, Appendix D of Annual Report for 1865-66). Badjirat (No. 6) is synonymous with booke (No. 4). The names are given as in the original list.

96. Departmental operations were started in 1865. Samples of nine of the best timbers were sent to Calcutta; the Agents of the East Indian Railway and Eastern Bengal Railway agreed to take some tons of katus and champ wood for experiment in building wagons; oak sleepers were also cut for export.

97. Owing to the absence of roads or paths the eastern slopes of the Senchal range could not be worked. Thus the tract first exploited comprised the western slopes, estimated at $5\frac{1}{2}$ square miles.

The fellings were made chiefly to supply the Public Works Department with timber for the new barracks and for the cart road then under construction, as well as to provide a stock of seasoned timber for building in Darjeeling and the district generally.

Thousands of logs were prepared and left in the forests to season; many thousands of cubic feet were converted into scantlings, and several lakhs of shingles were cut in the less accessible forests.

98. The fellings appear to have been first made in two definite localities, namely, at Rangbul and near Mahaldaram above Kurseong. At Rangbul 500 trees were to be yearly converted into logs, a similar number of trees being girdled for the next year's felling. At Mahaldaram 200 trees were to be cut into logs, and 200 to be be girdled yearly. The areas felled near Mahaldaram were planted up with chestnut and walnut, and planting of chestnut and champ was also done on the area worked at Rungbul. Operations were not, however, confined to these two localities Timber was also worked out along the whole length of the old Military Road between them.

These timber operations resulted in loss, even without reckoning the advances given to contractors, which in many cases were never recovered ; and in a few years it was recognized that the outturn exceeded the demand. (*See* Annual Progress Report for 1868-69, paragraph 129, and Government Resolution thereon, paragraph 28.)

99. The unsatisfactory results were, however, at first attributed to the low prices obtained for the timber sold and made over to public departments. It was therefore sought to fix some rates which should fairly represent the value of the timber standing in the forest. The rates fixed were as follows :—

Kinds of Timber.	Rates for timber delivered in the forest on a road, or on a river bank* in the plains.		Remarks.
	Rates per cubic foot—forests above 4,000 feet.	Rates per ton—forests above 4,000 feet.	
(*i*) *First class.*	Rs. A. P.	Rs. A. P.	* The term "on river bank" means the river bank station nearest the hills, such as Siligori on the Mahanuddee, Doomanee on the Tista, Alipore on the Kalajanee, &c.
Walnut ...	0 12 0	37 8 0	
White magnolia and chestnut ...	0 10 0	31 4 0	
Red magnolia and oak (booke)	0 8 0	25 0 0	
(*ii*) *Second class.*			
Oak, chalawnee	0 6 0	18 12 0	
Cherry, lali	0 4 0	12 8 0	

100. These rates seem to have been applicable only to timber worked out by government agency for the supply of public departments. The sale of trees in small numbers at a fixed price apiece was continued, whereas departmental operations were soon abandoned. The sale of trees on permit was thus established, and has survived until now. This system was at the outset regarded as a rough and provisional expedient, and as such was sanctioned by the

Governor-General in Council, on the express understanding that the trees sold should be selected by responsible forest officers, that efficient measures should be taken to guard against the felling of trees which were not intended to be sold to the permit-holder, and against other injury to the forest. (*See* Government of Bengal Proceedings for September 1868, pages 5, 6.) These most important conditions proved ineffectual. It was for a long time impracticable for the small staff of the Forest Department to select and mark the trees in all parts of the forests, and yet not expedient to refuse to satisfy the demand wherever it might spring up. Moreover, if responsible forest officers had marked the standing trees to be offered for sale, yet the price being fixed at so much a tree, purchasers would undoubtedly have objected to take defective or under-sized trees unless an abatement had been made in the price. The difficulty could in fact only be met by selling timber by measurement, the price being graduated according to quality. As an instance of serious damage done, owing to neglect in this matter, reference may be made to the report of a tour of inspection by Lieutenant W. Stenhouse, Officiating Conservator of Forests, Bengal, dated the 20th October 1870. In paragraph 20 the following passage occurs:—"The sâl forest on the outer hills between the new Darjeeling road and the Mahanadi river was next examined. This tract has been stripped of nearly every sâl tree sufficiently large and sound to yield one railway sleeper, and consequently natural reproduction has been checked in a most serious manner. In many places there are no seedlings to be seen where the numerous stumps testify to the former abundance of seed-bearing sâl trees. The size and age of the stumps observed show that numbers of under-sized trees were felled by the contractors employed by the Forest Department. It is evident, therefore, that the work of selecting and marking the trees to be felled cannot be safely entrusted to contractors, but must be done by responsible forest agents only." If this is important in sâl forests, where the reproduction of this species is so easily managed, how much more important is it in the temperate forests, where the reproduction of the most valuable species is slow and uncertain and a host of inferior species invades the ground.

101. The necessity of placing the cutting of timber for scantlings on a proper footing was considered in 1882 by the Officiating Inspector-General of Forests, Dr. Schlich, who recommended that the sale of trees for scantling should be confined to certain localities at one time, and if possible to the coupe of the year. (*See* Memorandum of 21st April 1882, paragraph 27.) This recommendation appears to have come to nothing, as it was found impracticable to supply all the timber required from the compartments allotted to the year. (*See* Annual Progress Report for 1882-83, paragraphs 348 and 354.)

102. The attempts made from time to time to introduce a cubic-foot rate for the sale of timber standing in the forest naturally failed, as the rate per tree was not abolished, the purchaser being practically allowed to select the finest and biggest trees. Dry and fallen timber was sold by the cubic foot; but at the fixed prices charged for green standing trees such timber was actually cheaper per cubic foot than the dry and fallen wood. This is shown in the statement of outturn of the past ten years. (*See* pages 66, 67.)

103. The only important change (because the only one at all effectual) introduced in this respect was made with effect from the 1st November 1885, when, in addition to the price fixed for trees measuring 8 feet in girth at four feet from the ground, enhanced prices (calculated by adding 10 per cent. for every foot or part of a foot in girth over eight feet) were charged for trees above that size.

But even this reform, whilst securing a price in some proportion to the size of the tree, did not prevent the selection by the purchaser of the largest and finest trees; so that the over-mature and decaying trees, and those damaged, badly grown, or of no promise have gone on accumulating on our hands in increasing numbers, cumbering the ground, suppressing the young trees, and seriously menacing the future of the forest by impeding the reproduction of the best species.

As a consequence of the new rates, the sales of standing trees for a time diminished, and the demand for dry and fallen timber steadily increased. The rates for the latter had been previously reduced by half (in October 1884) and made applicable also to green timber in the vain hope that purchasers would

take standing trees at those rates, whilst they had the option of paying a fixed price per tree. (*See* paragraph 158.)

104. Another endeavour was made in 1889-90 to secure "this most useful and long-needed improvement, namely, the selection and marking of all growing trees for felling by a Gazetted officer." (*See* the Annual Progress Report for 1889-90, paragraph 119.) But without reforming the entire system of forest management, the only result of this attempt was to place the Gazetted officer at the beck and call of every person who proposed to purchase a tree. The arrangement was not approved by the Government of Bengal nor by the Government of India, and it must be admitted that it was an ill-considered measure, quite as much calculated to inconvenience the purchaser, as it was certain to impede the proper course of administraton.

Fuel oporations started by government agency in 1877-78.

105. Besides selling produce to purchasers on permit, the Department has carried on operations by government agency since 1877-78. The timber operations were unimportant and have now ceased, though timber has occasionally been cut and brought to depôt for the use of the Department.

The fuel operations have been more extensive, and when first started, clean fellings were made and reproduction attempted, partly by sowing seed at stake and partly by close planting, the ground being staked out $10' \times 5'$. Seedlings one year old were to a great extent used, and it was found that they could not contend against the luxuriant growth of weeds. Close planting was, moreover, expensive, whereas the system of planting along horizontal (contour) lines which was subsequently introduced, gave very good results when plants two to three years old were used and planting was done in the early part of the rains (not later than the middle of August); provided also that the lines of plants were regularly cleared. Entire clearances had early been condemned, as they were found to cause a dense growth of weeds in some places and turf in others. In the former case the plants were liable to be smothered by weeds, brambles, and quick-growing soft woods, and in the latter they did badly for want of shelter. The absence of seed-bearers also left no hope of obtaining natural seedlings of valuable species to complete the stock. To remedy this last objection a few scattered trees, or rather poles (mostly champ), were left in the Dooteria block. Branches, however, developed on their stems, and they generally became stagheaded. It does not appear that they were of any use for reproductive purposes.

106. A working-plan was drawn up for the period 1880 to 1890. This was originated by Mr. (now Sir Dietrich) Brandis, then Inspector-General of Forests, who visited the Darjeeling Forests in 1879, and embodied his recommendations in a pamphlet entitled "Suggestions regarding the management of the forests in the Jalpaiguri and Darjeeling Districts, Bengal," dated Simla, the 1st November 1880. This work is referred to as "Suggestions" in the pages of this report. Sir D. Brandis at the time of his visit found that the chief task of the officer in charge of the Darjeeling forests was to supply the station of Darjeeling and the cantonment of Jalapahar with timber, fire-wood, and charcoal ("Suggestions," paragraph 40.) Accordingly, his suggestions were directed principally to this object. He did not profess to draw up a complete working plan: he did not even consider what rotation should be adopted, nor did he form a single complete working-circle. He simply made suggestions as to the method of treatment to be applied, the order in which the fellings should be made; and basing his calculations on the material required annually for Darjeeling and Jalapahar alone (which he estimated at 500,000 cubic feet), he proceeded to discuss the arrangement of future fellings. Taking only into account the more accessible blocks (aggregating 12,257 acres), which he considered to be available for the supply of Darjeeling and Jalapahar, he estimated that this area, worked in accordance with his suggestions regarding treatment, would supply the above-mentioned demand for a period of 74 years, and within that space of time he expected other areas to be opened up by roads and so made available. He expressly states ("Suggestions," paragraph 54) that his forecast is to be regarded "as merely approximate and subject to many changes as the work progresses."

Working Plan originated by Sir D Brandis.

As regards yield, his arrangement of fellings was based upon area. He considered the number of years which it would take to exhaust each block below 7,500 feet elevation when worked according to his method of treatment. The method was briefly as follows:—

Above 7,500 *feet elevation.*—Selection fellings.

Below 7,500 *feet elevation.*—Partial clearances with planting in horizontal lines on favourable ground. Vigorous trees of valuable kinds to be left not singly but in groups and bands at intervals to give shelter, and generally so on steep and rocky slopes, and along the beds of ravines and streams ("Suggestions," paragraphs 55-56). Sir D Brandis remarks upon the scarcity of seedlings of valuable species, specially oak, and concludes that natural reproduction will not suffice to restock the forest, though seedlings of maples, kawla and some other kinds will assist to secure this end. He therefore advises artificial reproduction, and at the same time states that even with the greatest care it will be some time before the clearances made will be reclothed with a complete stock of young growth ("Suggestions," paragraph 59).

Agency of exploitation.—That the forests would be worked by government agency was taken for granted.

The grazing question.—This was not considered. The only remark bearing on the subject is to the effect that the first condition of success in restocking the areas worked is to keep out cattle and fires.

Works of improvement.—In the "Suggestions" great stress is laid on the necessity of opening up communications in order to extend the area available for the supply of Darjeeling. The chief works recommended were the extension of the Goompahar Cart Road, and the widening of the Pashok Road, so as to admit of cart traffic as far as Poomong. A branch road opening out the whole of the Rangbi block was also advised. In fact, Sir D. Brandis' last injunction was that "communications must be extended."

Revision of Sir D. Brandis' plan by Dr. Schlich.

107. As anticipated by Sir D. Brandis, changes soon became necessary. Difficulties in connection with the fuel-supply of Darjeeling and grazing brought about a revision of the scheme in 1882.

In February of that year Dr. W. Schlich, Officiating Inspector-General of Forests, inspected most of the forests, and in his "Memorandum on the management of the forests in the Darjeeling Division, Bengal, dated Simla, the 21st April 1882," drew up a working scheme for the ten years from 1880 to 1890 The suggestions it contained were the result of discussions between Dr. Schlich, the Conservator (Mr. J. S. Gamble), and the Divisional Officer (Mr. E. G. Chester.) This working plan will be referred to as the "Memorandum." Reference must also be made to the orders of the Government of Bengal on this scheme, contained in Mr. McDonnell's letter, Revenue Department (Forests), No. 511TR, dated the 2nd October 1882. These orders relate principally to the settlement of grazing, and further to the arrangements to be made for the supply of fuel to Darjeeling, in which matter the proposal for abandoning the business to private enterprise was approved. The regulation of grazing was subsequently dealt with in rules made by the Local Government under the Forest Act, and published in a notification, dated the 10th October 1885. These rules will be found in Appendix IV.

Various changes in the areas, and the construction of roads in the previous two years were held to have necessitated a rearrangement in the working; but it must be noted that Dr. Schlich's scheme was not intended to supersede Sir D. Brandis' "Suggestions," but to augment them. ("Memorandum," paragraph 2.)

It was, however, practically a new plan.

The Singalilà forest, lately parchased, was left out of consideration. The remainder of the Division (24,288 acres) was formed into five working-circles as follow:—

	Acres.
Darjeeling Supply Circle	6,758
Jalapahar Circle	5,266
Kurseong „	2,761
Railway and Tea Plantations Circle ...	7.941
Cinchona Department Circle	1,062
Total ...	24,288

But just as Sir D. Brandis had disregarded all demands other than those of Darjeeling and Jalapahar as being insignificant, so Dr. Schlich's plan applied chiefly to the Darjeeling and Jalapahar Circles. This arrangement has been observed with the slight modification of including the whole of the Balasan and Chongtong blocks in the Darjeeling Working-Circle, bringing the area of that circle up to 7,716 acres, and reducing the area available for Tea Plantation supply by 958 acres. But produce from the first two circles, when available, has been sold to purchasers irrespective of the market to be supplied. The demand of the railway has been very slight; that of the tea industry has developed considerably, whilst the Cinchona Department has given us no custom at all. In the formation of working-circles it seems to be useless and futile to specify the market to be supplied from each circle: all that is necessary is to make them as compact as possible, and to locate them with reference to the chief centres of demand.

108. The method of treatment prescribed in Dr. Schlich's Memorandum was:—

I.—Forests above the Cart Road from Goom to Lepcha-Jagat and above the Rangbi Road.—Here all sound, fairly straight trees, likely to last for another rotation, to be left; all others to be removed; at the same time the upper part of the ridges never to be cleared altogether; planting to be done in horizontal lines 20 feet apart; the plants to be 4 feet apart in the lines."

II.—Forests below these roads.—Only poles and saplings to be left; all larger trees being removed; planting to be done in horizontal lines as above; clearances permitted along lower edge of forest if future treatment as coppice be desired; areas so cleared to be planted closely in lines not more than 10 feet apart; age of transplants to be two to three years; sufficient seed being sown whenever there was a good seed year; clearing of lines to a breadth of 3 or 4 feet to be repeated until the plants could hold their own. ("Memorandum," paragraphs 10,11.)

An account of the manner in which the Brandis-Schlich plan was applied.

109. The method of treatment prescribed by Dr. Schlich thus differed materially from that recommended by Sir D. Brandis, and for the forests above the roads mentioned (which include those above 7,500 feet elevation) would, except on the upper part of ridges, have occasioned very heavy fellings; for very few of the trees in these forests are sound, fairly straight, and likely to last for another rotation.*

With reference to the treatment proposed by Dr. Schlich for forests above these roads, Mr. Gamble recorded this note: "I would leave even more, as, if the ridges are much thinned, windfalls get very numerous." According to Sir D. Brandis, whose suggestions had not been superseded, the cuttings above 7,500 feet elevation were to be made as sparingly as possible, and their outturn was not reckoned in estimating the yield. The latter method appears to have been followed unaccompanied by planting.

The method prescribed by Dr. Schlich for forests below the roads has not been followed. The Conservator (Mr. Gamble) in the first instance decided that a very large interpretation should be given to the term 'poles,' which "should include most sound, straight trees not too big." When asked by the Divisional Officer to fix a limit of size, the Conservator (Mr. Home) issued the following instructions:—

"The term 'saplings and poles' will be considered as including all saplings and trees up to 4 feet in girth, and in addition to this ten large trees per acre should be left as seed-bearers, and to afford shelter to the young seedlings whether introduced artificially or by nature, as well as to preserve the humus."

Dr. Schlich appears to have approved of two sample plots being treated according to the regular regeneration method—one in the Rangnu, the other in the Tungsong block. Thus we find that in compartment 3 of the latter block the trees to be felled in 1882-83 were marked by the Divisional Officer with the view of "making, as far as the condition of the forest would allow, a seed-cutting" (*See* Annual Progress Report for 1882-83, paragraph 73.)

The instructions as to the size of trees to be left, which were issued on the 20th October 1883 quite altered the method of treatment, and explain

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* The only rotation mentioned by Dr. Schlich was 120 years. ("Memorandum," paragraph 7.)

how it is that on the areas worked since 1882 the old forest still remains fairly well stocked with trees of all sizes. The reason also becomes manifest why timber could not be obtained in any considerable quantity from the compartments allotted to the year. (*See* paragraph 101).

The expedient was then suggested (Annual Progress Report for 1883-84, paragraph 257) of working the compartment in two successive seasons—first for the removal of timber fit for scantlings, and next for fuel; but it was found that the method of marking the coupe according to the Conservator's instructions did not admit of any trees suitable for timber being felled.

It will be best to show the result of the modified treatment in Mr. Chester's own words. In his description of the Tungsong-Pubong block he records that the eastern part was clean-felled and planted. He continues: "In the western parts the crop was thinned and, cattle being excluded, young growth came up. This thinning left a few seed-bearers and all small poles and saplings not destroyed by the felling operations. The distribution of thicket is, however, not continuous. In places poles and occasional large trees are standing; in others poles only. The advance growth consists generally of thicket bushes, and saplings of kharani, generally fairly complete; it is filled in with a thick growth of bamboos. As grazing was stopped here in 1883 only, the state of reproduction is satisfactory. These compartments will be ready for a final felling, which will remove the trees in 5 to 10 years' time. It will not be necessary to plant the better species. In the central compartments the seed-bearers are more numerous, and there is a fair number of natural seedlings of oak and chestnut. The advance growth is good. In compartment 2, which was clean-felled, large blanks were planted up between 1879 and 1883. The plants, especially those of champ, are doing well."

The method adopted may have been very good in itself, but it was not the method prescribed in the Plan. Mr. Chester's description shows that improvement fellings were made with a view to natural reproduction, though he calls them thinnings.

The condition of the forest did not permit of typical regeneration fellings, and the underwood was left. The forest has thus remained quite irregular, the treatment having really been that of improvement fellings. This change of system has not harmed the forest, but it caused inconvenience and a further departure from the provisions of the working-plan in subsequent years, inasmuch as the Tungsong and Pubong blocks, which should have satisfied the demand until 1890 (*see* "Memorandum," paragraph 16), had been worked through by 1886-87, when operations were extended to the Balasan block, notwithstanding that this block was open to grazing and could not at the time be closed. Planting, which had never kept pace with the fellings, was of course discontinued; the fellings of green trees in the Balasan block were restricted as far as possible, the material being gleaned here and there by removing dead and decaying trees.

Fortunately, about this time the extension of the Goompahar cart road necessitated the utilization of a large quantity of material along the trace. The difficulty was thus overcome; but the fact remains that the forest has not been worked as prescribed, and is not now in the condition in which it was expected to be.

110. Clearances and plantations, with a view to coppice along the lower edge of the forest, were not made. Even in the case of sub-compartments put up for auction during 1883-84, those at the lower edge of the forest could not be sold owing to their distance below the road and to the circumstance that dead trees only had been marked, which would have rendered the cost of removal excessive. It seems that these portions were not even worked by the Department, though it had to step in to complete the necessary fellings and clearances in some cases (*see* Annual Report, 1883-84, paragraphs 38 and 40), and it was contemplated to sell the material in the lowest sub-compartments to charcoal makers.

It would perhaps have been wiser to have made complete clearances and to have planted up the area as suggested by Dr. Schlich, whether treatment as coppice had been subsequently adopted or not; but Dr. Schlich's provision on the subject was permissive only, and Mr. Chester has recorded in the Forest Journal (page 206) his reasons for not adopting the suggestion. He points out that the

lower parts of the forests are, as a rule, the least accessible, and therefore most difficult to protect, whilst in coppice damage is particularly difficult of detection; that these parts have suffered and are liable to suffer most from the inroads of cattle, and that coppice suffers much more from grazing than a high forest. Moreover, he states that as the greater part of these forests must be treated as high timber, the existence of a few patches or long narrow strips of coppice would be inconvenient. Additional reasons against coppice treatment are given in Part II, paragraph 225 of this report in discussing the method of treatment.

111. As regards the age of transplants and the clearing of lines, these matters seem to have been attended to with good results. A case is on record of the clearing of lines, when too long deferred, having (in the Rangnu block) resulted in the plants becoming too spindly to remain upright when the lines were cleared 4 feet broad. It would in that case have been preferable first to have set free the tops of the plants and to have repeated the operation when the plants had become more robust.

Control of the annual yield has been imperfect.

112. The basis of calculation of the annual yield seems to have been overlooked, and the control of operations to have been based on volume instead of area, notwithstanding that Sir D. Brandis' plan was distinctly based on an area capability ("Suggestions," paragraph 48). Taking into account the elements of production in the different blocks, the areas which he assigned for one year's supply varied from 75 to 250 acres ("Suggestions," paragraph 53).

Dr. Schlich also prescribed an area capability. The working circles were roughly fixed by him on this basis, with an injunction that the correct apportionment should be brought about by adding to the Darjeeling Supply Circle in the Goompahar Range, so that the areas of the two circles should be in the same ratio as the demand that they were intended to supply, viz:—

	Probable requirements. Cubic feet.	Proportion in per cent.
Darjeeling Circle ...	325,000	65
Jalapahar do. ...	175,000	35
	500,000	100

Of this quantity, it was supposed that the proportion of timber and fuel would be—

	Cubic feet.
Timber	150,000
Fuel	350,000

On the assumption that the fellings (according to the method of treatment prescribed) would, on an average, yield about 2,500 cubic feet per acre, the area to be felled annually was taken to be 200 acres:—

	Acres.
Darjeeling Circle	130
Jalapahar do.	70
	200

It was, however, provided that dry wood should be utilized to the utmost, so that the above areas were to be regarded as maxima.

That an area capability was understood to be intended seems clear from the last clause of paragraph 223 of the Annual Progress Report for 1882-83; but we have seen (paragraphs 109, 110 above) that the method of treatment prescribed was not strictly adhered to, and the capability came in time to be regarded as based on volume.

113. The outturn of timber and fuel is summarised as follows:—

The actual outturn during the 10 years of the Brandis-Schlich plan.

Period 1880-81 *to* 1889-90.

Working-Circle and Agency of Exploitation.	Outturn in cubic feet, solid.		
	Timber.	Fuel.	Total.
Darjeeling Supply Circle.			
Government Agency	29,350	1,567,708	1,597,058
Purchasers	370,546	1,462,100	1,832,646
Free grantees	500	.....	500
Total ...	400,396	3,029,808	3,430,204
Average yearly ...	40,040	302,981	343,020
Jalapahar Supply Circle.			
Government Agency	1,723	1,026,274	1,027,997
Purchasers	290,187	44,124	334,311
Free grantees	... ..	469	469
Total ...	291,910	1,070,867	1,362,777
Average yearly ...	29,191	107,087	136,278
Darjeeling and Jalapahar Supply Circles combined.			
Government Agency	31,073	2,593,982	262,055
Purchasers and free grantees ...	661,233	1,506,693	2,167,926
Grand Total ...	692,306	4,100,675	4,792,981
Average yearly ...	69,231	410,068	479,299

Compared with the forecast, the outturn of timber has thus been less than half what was anticipated, and that of fuel about 60,000 cubic feet per annum more. Taking timber and fuel together, the outturn has been 20,700 cubic feet per annum less than the forecast, or 4·14 per cent.

114. The proportion in which each circle contributed to supply the demand was*—

	Actual per cent.	Forecast per cent.
Darjeeling Supply Circle	72	65
Jalapahar ditto	28	35
Total ...	100	100

This indicates the utility of the Goompahar cart road and the need of a road to open up the better stocked forests of the old Jalapahar Supply Circle, viz., those to the north and east of the Senchal mountain.

The divergence of the actuals from the forecast in this respect is all the more marked because the areas assigned to the two circles were not divided in proportion to the outturn expected from each (*see* "Memorandum," paragraph 6); the actual ratio of apportionment (including the whole of the Balasan and Chongtong blocks) was—

Darjeeling Supply ...	59	per cent. of combined area.
Jalapahar ditto ...	41	ditto ditto.
	100	

* *See*, however, paragraph 120.

115. The proportion of outturn removed by government agency and by purchasers (including free grantees with the latter) was—

	Government Agency.	Purchasers (including free grantees).	Total.
Timber ...	4·50 per cent.	95·50 per cent.	100
Fuel ...	63·26 ditto.	36·74 ditto.	100
Timber and fuel	54·76 ditto.	45 24 ditto.	100

The supply of timber to the public may thus be said to be entirely in the hands of dealers; for the small quantity exported by government agency was almost all used by the Department. This fact indicates not only that the sale of timber trees at a fixed price per tree has been profitable to the dealers, but also that there is no necessity for the Department to sell timber from depôts. As regards fuel, the supply of Jalapahar has always been kept in the hands of the Department, and only feeble attempts have hitherto been made to abandon the supply of Darjeeling station to private enterprise. The Department has at no time entirely ceased from competing with dealers in the retail sale of firewood in the station of Darjeeling, and has kept the supply of charcoal as much as possible in its own hands. In paragraph 310 of the Annual Progress Report this arrangement is said to be in accordance with the Inspector-General's recommendations and the orders of Government. The financial aspect of the case is discussed in paragraphs 127-129.

116. The average annual outturn per acre calculated on the total area of the working circles is as follows:—

		Cubic feet per acre per annum
Darjeeling Supply Circle (area 7,716 acres) ..	Timber ...	5·2
	Fuel ..	39·3
	Total ...	44·5
Jalapahar Supply Circle (area 5,266 acres) ...	Timber ...	5·5
	Fuel ...	20·3
	Total ...	25·8
General average of the two Circles	Timber .	5·33
	Fuel ...	31·58
	Total ...	36·91

These figures are sufficient to show that the general outturn per acre has been small, especially in timber, although 250 cubic feet have been taken for every standing tree sold on permit. The outturn of dry sticks has also been included in the fuel.

The other factors of conversion employed are the following:—

1 polo	10	cubic feet.
1 maund, or load, of firewood	1·75	
1 „ or bag, of charcoal	7	„
1 monthly permit for firewood or dry sticks ...	52	„
1 cord of firewood	82	„

117. The forest crop, however, was not uniform, and the intensity of working varied very considerably, as explained above in paragraphs 109, 110 which review the method of treatment applied.

Almost complete clearances were provided for. Dr. Schlich calculated that the growing stock per acre might be about 2,500 cubic feet. Clean-fellings in

the upper part of the Dooteria block had been found to yield about 2,766 cubic feet per acre, and this part of the forest was in a more or less ruined condition. (*See* Annual Progress Report for 1877-78, paragraph 54.)

The Rangbul block, which was also clean-felled, was in a similar condition: part of it (144 acres) was occupied by a plantation which had been surveyed and mapped in 1874. The areas clean-felled and planted are stated in the annual reports. We can thus make a fairly approximate calculation of the stock, such as it was, per acre, and this will serve as a check in forecasting the outturn of other blocks:—

RANGBUL.

Previous condition.	Acres.	Treatment and present condition.	Particulars of outturn.
Area of plantation in 1874	144	*Treatment.*—Clean-felling and planting, with sowing at stake in some parts.	Omitting 2,900 cubic feet on account of 290 poles, the outturn was—
The area added during 1878-79 had been cleared of almost all good trees, and was mostly stocked with kawla, paieli, and other laurels, bâk, phalât, katus, and miscellaneous kinds. Champ had entirely disappeared.	103	*Present condition.*—Thicket, complete or nearly so.	C. ft. Timber { I.—By Government ... 5,931 II.—By Purchasers ... 16,750 } 22,681 Fuel ... { I.—By Government... 350,801 II.—By Purchasers ... 178,417 } 529,218 Total ... 554,799
Compartment 9 on the slopes of Senchal, damaged by fire in 1876 and afterwards by grazing. The fire killed nearly every tree, and these were cut for fuel (Annual Report for 1881-82, paragraph 69).	34	A few trees left in compartment 9, which subsequently died, have from time to time been cut and removed.	Area cleared, say 150 acres. C. ft. Average per acre ... { Timber ... 151 Fuel .. ... 3,528 Total ... 3,698 Percentage ... ... { Timber ... 4 Fuel ... 96 } 100
Area of plantation in 1890	281		NOTE.—If dry sticks 15,424 cubic feet be omitted, the yield per acre will be 100 cubic feet less.

DOOTERIA.

Previous condition.	Treatment and present condition.	Particulars of outturn.
Stock incomplete in upper part	*Treatment.*—clearances and planting.	C. ft. Timber ... { I.—Government agency ... 3,469 II.—Purchasers 71,340 } 74,809
NOTE.—The area taken is the mean between Dr Schlich's figure 534 acres and 566 acres, the area accepted in 1880-81 which fairly agrees with the latest computation and is the safest in this case.	*Present condition.*—Thicket, complete, with a few isolated trees or poles, mostly champ.	Fuel ... { I.—Government agency .. 1,092,931 II.—Purchaser... 238,491 } 1,331,422 Total ... 1,406,231
		Area cleared,* 550 acres. C. ft. Average per acre ... { Timber ... ... 135 Fuel ... .. 2,421 Total ... 2,556 Percentage ... ... { Timber ... 5·3 Fuel ... 94·7 } 100

Thus the outturn of the Dooteria block decreased as the fellings reached the lower part of the block, and we know that the upper part, which yielded 2,766 cubic feet per acre, was not fully stocked. The average of the three results would be very nearly 3,000 cubic feet per acre.

Order and arrangement of the fellings.

118. The order and arrangement of the fellings suggested by Sir D. Brandis consisted simply in arranging the blocks to be worked in a single series. He prescribed that fellings should be continued in the Goompahar Range before proceeding to the Takdah Range, or the remainder of Rangbul ("Suggestions," paragraph 52).

It would seem that there was a tendency, when the Goompahar cart road was made, to leave off working the Dooteria block after exhausting the upper accessible portion near the cart road. Dr. Schlich's plan corrected this. He formed separate working circles, but his scheme was devised to regulate principally departmental operations in the Darjeeling and Jalapahar Supply Circles, and his prescriptions regarding these were:—

I.—DARJEELING SUPPLY CIRCLE.

First, to clear the Rangbul block of dry wood; charcoal to be made in the lower part of Dooteria block; clearances, at a maximum rate of 130 acres a year, to be made in:—

		Area.
Tungsong block	... ...	658 acres.
Pubong „	...	614 „
Total	...	1,247 „

In the event of these being insufficient to provide for Darjeeling until 1890, work might be continued in the Balasan block ("Memorandum," paragraphs 9 and 16).

II.—JALAPAHAR SUPPLY CIRCLE.

Removal of a few dead trees in Senchal block;
ditto of dry wood in this and other localities;
clearances, at a maximum rate of 70 acres a year, to be made in—

		Area.
Rangnu block *	... ...	200 acres.
Rungirum block	... ...	500 „
Total	...	700 „

* NOTE.—Omitting the lower three-fifths of the lock which for the most part contained only scrub.

The above provisions relate to the principal fellings. No rule was laid down for the working of the other blocks during the ten years; but we may conclude that the existing practice of selling produce on permit was to go on, unless the sale of trees for scantlings could be confined to certain localities at one time, and if possible to the areas worked for fuel. ("Memorandum," paragraph 27.)

119. The order and arrangement prescribed have been generally followed; but other blocks have been worked as well, whilst unclassed fellings and the removal of dead wood have not been regulated. The following statement

exhibits this. It includes produce removed by Government agency (I), and by purchasers (II):—

Block and Area.	Agency of exploitation.	Outturn. Timber and fuel—1880-81—1889-90.	Nature and year of working.	Present condition.
Darjeeling Supply.				
		Acres.	Total c. ft.	
Rangbul	I	(650)	110,065	C., 1881-83	Thicket with plantation.
	II		165,104	D. W., 1882-90	
			275,169		
Dooteria	I	(534)	344,598	C., 1880-89	Ditto ditto.
	II		281,768		
			626,366		
Tungsong-Pubong ...	I	(1,267)	499,939	I. (R. Sample compartment).	I. H. F. and thicket.
	II		384,398	1880-87 .. .	
			884,337		
Balasan	I	(811)	288,036	S. F. and U	I. H. F. thin.
	II		02,544	1886-90	
			351,480		
Goom	I	(600)	193,252	C. (Partial)	I. H. F. thin and thicket.
	II		194,884	1882-85 and D. W. ...	
			388,136		
Nai	I	(839)	73,036	S. F. 1888-90 and U. ..	I. H. F.
	II		156,394		
			229,430		
Rishihat	I	(835)	18,256	U.	I. H. F.
	II		77,767		
			96,023		
Chongtong ...	I	(1,047)	6,900	S. F., 1888-90 and U.	I H. F.
	II		307,014		
			313,914		
Sonada	I	(665)	41,801	S. F. and U. ..	I. H. F. with few big trees.
	II		177,903		
			219,704		
Pachim	I	(468)	20,275	S. F. 1886-87 and 1889-90.	I. H. F. ditto ditto.
	II		24,870		
			45,145		
Total of Darjeeling Supply Working Circle		(7,716)	...	3,429,704	
Jalapahar Supply.					
Senchal	I	(517)	951,535	S. F., 1880-90	Blanks and I. H. F.
Rangnu	II	(500)	49,727	1. 1880 to 1890 and R. sample plot, 1882-83.	I. H F. above scrub below with plantation.
			1,001,262		
Rangirum ...	I	(500)	75,745	U. and R.	I. H. F. (About 40 acres lately worked and planted).
	II		38,796	1889-90	
			114,541		
Dawalpani	I	(857)	...	U.	I. H. F. above; scrub and plantation below.
	II		3,300		
			3,300		
Rangjo	I	(1,100)	97	U.	I. H. F. mostly thin, some blanks.
	II		88,843		
			88,940		
Tiger Hill	I	(755)	620	U.	I. H. F.
	II		40,347		
			40,967		
Rangbi	I	(1,03	...	U	I. H. F.
	II		107,298		
			107,298		
Total of Jalapahar Supply Working-Circle ...		(5,264)	...	1,363,308	

I. means Government Agency.
II. ,, Removed by purchaser.
I.H F. ,, Irregular High Forest.
S.F. ,, Selection Fellings.
U. ,, Unclassed.
C. ,, Clean fellings.
I. ,, Improvement fellings.
R. ,, Regular regeneration fellings.
D.W. ,, Removal of dead wood.

Where the year is not given in the above statement there was no regulated system of working. Separate estimates of outturn have been made for areas cleared in Rungbul and Dooteria blocks. (*See* paragraph 117.) For the other blocks it would be useless to calculate the average outturn per acre on account of the desultory character of the fellings.

Thus, even in these two working-circles alone, work has been carried on in many different places each year ; and this, it must be admitted, rather for the convenience of supplying the demand than on account of the exigencies of the forest crop in the matter of treatment.

Disposal of the produce.

120. The two chief working-circles were intended to supply Darjeeling and Jalapahar respectively, but the distinction was not always observed; produce of the Darjeeling Circle being sometimes sent to Jalapahar and *vice versâ;* besides which the supply for these markets was in some instances drawn from forests not included in these working-circles.

The general account of the outturn of timber and fuel for the ten years will be found in paragraph 113.

Agency of exploitation.

121. The question as to what agency of exploitation is most suitable in these forests has been frequently considered and differently decided. There can be little doubt that according to circumstances different systems of working may be advisable. The essential points are that the forest should be properly treated, that the stock should not be unwarrantably reduced, and that the forest estate should be steadily improved and its economical working facilitated.

But in dealing with questions of this kind it is more useful to consider the experience of the past than to advance individual opinions. It appears then that the results of the earliest departmental operations were not profitable; timber was felled in excess of the demand and was left scattered about the forest, nominally to season, but in fact to decay and become in great part unsaleable. From 1872 to 1875 the Department was occupied in collecting and disposing of the timber cut in previous years. When that was done it was decided to work the Terai forests chiefly by departmental agency, and it was hoped that the upper hill forests of Darjeeling might be worked on that system, because under the circumstances then existing it seemed to be "the only one likely to produce the greatest possible yield and prevent waste of material." (*See* Annual Report, 1874-75, paragraph 133.)

The opinion was also expressed that, where areas were limited and reproduction in need of special assistance, this system would have to be introduced throughout the forests. (Annual Report, 1876-77, paragraph 28.)

The supply of fuel in Darjeeling was undertaken by the Department rather hurriedly in 1877-78. It was said that departmental working was extended to the Darjeeling forests during the year, "as there was great danger of the forest around the station of Darjeeling not being capable of yielding all the material required unless carefully husbanded." (Annual Report, 1877-78, paragraph 33.) In paragraph 53 of the same report the disadvantages of the previous practice are stated, viz., that "only the very best trees were purchased and converted into timber, firewood, and charcoal, while hollow and crooked trees remained in the forest unused." Again, in paragraph 67 of the annual report for 1879-80, we are told that the direct supply of fuel by departmental agency was found necessary in order to stop waste, as trees which were good for sawing used to be cut up and sold as firewood by the purchasers. (*See* paragraph 131.)

It was not apparently recognized until some years later that it was not essential in the interests of forest conservancy that the Forest Department should undertake the direct supply of the station. But in 1881-82 (Annual Report, paragraph 83) the Conservator (Mr. Gamble) expressed a hope that Government would be induced—as he understood the Inspector-General had recommended—to abandon the direct supply of fuel in favour of private enterprise, as without departmental operations the Division would show very good results, especially when a more economical system of sale of standing timber to sawyers were introduced.

This brings us to the date of Dr. Schlich's "Memorandum," in which he explained how the direct supply of fuel was forced upon the Department, the sale "on permit" of trees for scantling only being in the meantime continued;

how difficulties arose in keeping the station supplied with fuel departmentally; how a Mr. Robinson took up the supply for a time, but had to abandon it as being unprofitable. He then discussed the *pros* and *cons* of departmental working and of private enterprise, and decided—

(i). As regards Jalapahar, that the supply by departmental agency should continue until other arrangements might be made with the consent of the Commissariat Department. Departmental supply was in fact continued for the ten years under review.

(ii). As regards Darjeeling, Dr. Schlich inclined to the plan urged by the Conservator and the Divisional Officer in favour of private enterprise, viz., to divide that part of the forest to be cut over in each year into a number of sections (or sub-compartments) of, say, 10 acres each and upwards; to mark all trees to be cut in each section, and then to sell the material either by public auction or at a fixed royalty. In the latter case purchasers were to cut, convert, and stack the material, after which it was to be measured up and paid for prior to removal.

Whilst pointing out the measures to be taken ("Memorandum," paragraph 28) to maintain the regular supply of Darjeeling, Dr. Schlich professed himself in favour of this business being transferred to the dealers. He says: "The alternative plan has several advantages, and I think it should be followed in the case of the Darjeeling station, provided it can be done in such a manner as to ensure a proper control by the Forest Department over the cutting operations. In the first place, this plan will relieve the Department of a troublesome piece of work, which is not necessary in the interests of forest conservancy; secondly, it will enable us to put the cutting of timber for scantlings on a proper footing. At present the practice is to sell the trees for scantlings at fixed rates per tree, and, as a matter of course, the sirdars will only take the very best and most favourably situated trees; the consequence being that scantling-cutting is going on all over the forests at the same time. This system must, however, be brought to a conclusion, and operations must be confined to certain localities at one time". ("Memorandum," paragraph 27.)

This matter attracted the notice of Government, and the following orders were passed:—"The Lieutenant-Governor approves the plan sketched out in paragraph 28 of Dr. Schlich's Memorandum. His Honour doubts whether the plan of selling on the spot the felled trees to private speculators will succeed without an increase of price to the consumers. But even an increase of price is, in his opinion, preferable to the Forest Department engaging in retail trade."

The experiment was tried, but not persevered with, although very encouraging results were obtained at the first auction, notwithstanding several mistakes which should have been avoided and might easily have been corrected. In the first place, departmental sales never wholly ceased, so that competition with dealers went beyond the keeping of a reserve stock. The manufacture and supply of charcoal was kept in the hands of the Department. The conditions of sale were not so favourable to dealers as they might safely have been. The rule regarding the cutting of the principal branches is an absurd rule in these forests, and has never been enforced even in the case of departmental operations. It was hardly judicious or opportune to allow only 250 cubic feet of stacked firewood as the equivalent of 100 maunds in the place of 300 cubic feet formerly allowed—an increase of nearly 17 per cent. The material was sold standing, the trees only being marked; and considering the inexperience of the buyers, who were not competent to make their own estimate of the yield, it is regrettable that the quantity should have been over-estimated by the Forest Officer. Nothing appears to have been done to provide export paths. Firewood could at the same time be obtained from blocks even more accessible than that in which the experiment was being tried, and which lay below the Goompahar Cart Road. The trees were too sparingly marked, so that the material was scattered and more expensive to work out than it need have been. The trees to be felled were marked by the Divisional Officer, making, as far as the condition of the forest wood allow "a seed-cutting." But the forest was, for the most part, not sufficiently well-stocked, nor in such a good and thriving condition as to allow anything of the kind, and this unavoidably led to the

marking of inferior fuel: indeed, in the sub-compartments furthest from the road, "dead trees only had been marked, so that the cost of removal was excessive." These lots did not find purchasers, and even the Department did not work them (*See* paragraph 110). The fact that it was afterwards contemplated to sell the material in the lowest sub-compartments to charcoal-makers, shows that it would have been wise if the conditions of sale had not restricted the purchaser to the removal of firewood only.

The result of the sale (quoted in the Annual Progress Report for 1882-83, paragraph 76) shows that an *estimated* quantity of 34,800 maunds of firewood was sold, the produce of six lots, five of which were sold for lump sums at a price per 100 maunds (*estimated*) varying from Rs. 3-3-2 to Rs. 8-7-5.

One lot, which no one would purchase for a lump sum, was disposed of at the rate of Rs. 6-8 per 100 maunds.

The average rate per estimated 100 maunds was Rs. 5-9-9; "but as the estimates were high, the actual price obtained per 100 maunds was considerably higher than here shown." If we only add one-sixth on account of reduction in the volume of stacked fuel allowed per 100 maunds as noted above, the average price would be Rs. 6-9 per estimated 100 maunds, so that, taking the quality of the wood into account, the price was high The Conservator (Mr. Home), commenting on the financial results of the year 1882-83 in paragraph 402 of his Annual Report, wrote thus—"Omitting capital expenditure, the Division has been worked at a profit which may be expected to increase steadily as the Department withdraws from the direct supply of timber and fuel."

The Forest Department, however, seems to have considered that the prices obtained at the auctions were too low, and this was attributed to want of competition. A suggestion was thrown out that the material should be sold at a certain rate per 100 maunds, varying with the distance from the cart-road (Annual Report, 1883-84, paragraph 40), but it does not appear that such a graduated scale of rates was ever introduced.

122. This attempt to work the forests systematically in respect of timber and fuel by the agency of dealers having been abandoned as a failure, the permit system continued in full force. A statement of the outturn removed under this system, during the ten years under review, from the Darjeeling and Jalapahar Supply Circles has been given in paragraph 113 above, and it has been shown that permit-holders removed 95½ per cent. of the timber and 36¾ per cent. of the fuel, taking the two Circles together. The proportion removed by government agency was, therefore. 4½ per cent. of the timber and 63½ per cent. of the fuel. But a large part of the timber was for departmental use and not for sale.

Departmental fuel operations.

123. The following table shows the sales of fuel to the general public, (*i.e.*, exclusive of public departments), from sale depôts, for the ten years under review, and separately for 1890-91. These sales represent almost exclusively the sales in Darjeeling:—

Year.	Firewood.	Charcoal.	Ratio per cent.—Charcoal. / Firewood.	Remarks.
	Mds.	Mds.		
1880-81 ...	92,166	12,756	13 8	
1881-82 ...	78 214	9,449	12 1	In 1881-82 Mr. Spencer Robinson and others removed fuel from the forests for sale in Darjeeling. The trade in firewood has since been largely carried on by dealers.
1882-83 ...	51,617	3,439	6·6	
1883-84 ...	16,977	4,656	27·4	
1884-85 ...	19,292	4,433	23 0	
1885-86 ...	19,786	10,670	53·9	
1886-87 ...	18,9 8	17,248	91'2	
1887-88 ...	15,3 6	9,924	64 7	Large quantities of Sal-wood charcoal brought in from Sikkim caused a falling off in sales during 1887-88 and 1888-89.
1888-89 ..	17,680	10,012	56 6	
1889-90 ...	28.782	23,837	82·8	
Total of 10 years.	358,748	106,424	29·6	
Average ...	35,87	10,642		
1890-91 ...	19,717	28,742	145 7	

It is said that charcoal is now generally preferred in Darjeeling, by the natives at least, as a better and more economical fuel than wood, and because it is less bulky. The above table supports this view, the proportion of sales of charcoal to those of firewood having increased since 1882-83 from 6·6 to 145·7 per cent., the quantity of charcoal sold in 1890-91 being at the same time nearly three times the average of the previous ten years, whilst that of firewood is little more than half.

124. The supply of fuel to public departments from sale depôts is exhibited in the following statement:—

Year.	Demand of public departments.		Remarks
	Firewood.	Charcoal	
	Mds.	Mds.	
1880-81 ...	51,500	300	
1881-82 ...	76,070	537	
1882-83 ...	65,112	411	
1883-84 ...	51,306	302	
1884-85 ...	57,500	645	
1885-86 ...	28,000	249	
1886-87 ...	55,090	285	
1887-88 ...	55,105	110	
1888-89 ...	56,734	372	
1889-90 ...	43,033	60	
Total ...	539,450	3,271	
Average ...	53,945	327	
1890-91 ...	7,076	1,018†	

Department supplied and character of demand.	Average demand for the 10 years.	
	Firewood.	Charcoal
	Mds.	Mds.
Commissariat Department—Steady demand	49,444	...
„ „ Occasional demand	...	29
Public Works Department—Military—Intermittent demand.	415	...
„ „ „ Fairly regular demand ...	...	170
Public Works Department, Civil—(first-half of decade only)	2,690*	...
„ „ „ Fairly regular demand ...	...	128
Jail and others—Intermittent demand	1,396	...
Total ...	53,945	327

* 3,379 maunds sold locally during 1883-84 would raise the annual average to 3,028 maunds.

† Includes 600 maunds supplied direct from the forest

125. The fuel removed from the forests by consumers or purchasers during the ten years under review has not all been brought to Darjeeling for sale, but if we take only the blocks in the Darjeeling and Jalapahar Circles and separate the fuel sold to tea-planters and the dry sticks which for the most

part go to Jorbungalow and Goom village, the remainder fairly represents the amount taken to Darjeeling—

Year.	Fuel removed by Consumers or Purchasers.						
	Fuel sold to tea-planters.			Dry sticks.	Other fuel removed by purchasers.		
	Firewood.	Charcoal.	Maunds of wood, taking one maund charcoal = 4 maunds wood		Firewood.	Charcoal.	Maunds of wood, taking one maund charcoal = 4 maunds wood.
	Maunds.	Maunds.		Maunds.	Maunds.	Maunds.	
1880-81 ...	1,000	..	1,000	...	...	...	...
1881-82 ...	511	300	1,711	...	19,892	1,341	25,256
1882-83 ...	...	4,000	16,000	...	76,305	5,312	97,553
1883-84 ...	1,000	1,500	7,000	...	58,799	2,550	68,999
1884-85 ...	2,975	...	2,975	...	76,300	7,798	107,492
1885-86 ...	6,929	4,250	23,929	7,230	102,420	1,093	106,792
1886-87 ...	12,000	...	12,000	.	97,320	1,700	104,120
1887-88 ...	37,050	...	37,050	6,240	38,553	1,610	44,993
1888-89 ...	28,550	...	28,550	13,264	60,050	2	60,058
1889-90 ...	31,800	...	31,800	21,043	51,537	...	51,537
Total ...	121,815	10,050	162,015	47,777	581,176	21,406	686,800
Average ...	12,181	1,005	16,201	4,778	58,118	2,141	66,680
Percentage...	...	...	18½	5½	...	76	...
1890-91 ...	25,375	...	25,375	31,980	19,094	...	19,094
Percentage ..	...	...	33	42	...	25	...

For this statement—

A cord of wood has been taken	as	50	maunds.
A monthly permit for dry sticks	„	30	„
A stump (10 cubic feet)	„	5⅔	„

The above table shows that the sale of dry sticks has become a most important item; that the demand for fuel for tea concerns is increasing, and that even in the working-circles formed for the supply of Darjeeling and Jalapahar, the fuel removed by tea-planters is now 33 per cent. of the total outturn of fuel of those Circles.

126. Replying to enquiries made by Dr. Anderson, the Commissioner reported, in his letter No. 439, dated the 10th February 1865, that in Darjeeling the rate per maund was 2 annas to 8 annas. Firewood was removed from the forests under monthly licenses or tickets, and in 1867-68 (Annual Report, paragraph 72) it was proposed to raise the rate charged for these licenses from 8 annas to 1 rupee per month and to reduce the cost of collection. In 1877-78, when the present Darjeeling Forest Division was formed, the rate appears to have been raised from Rs. 3 to Rs. 5 per monthly ticket (18 tickets were sold at Rs. 5 and 7 at Rs. 3). The departmental supply of wood was at the same time taken up, the royalty per hundred maunds in the forest being Rs 5. The sale of monthly tickets ceased until 1884-85, when ten only were issued at one rupee. This rate remained in force until the 1st October 1888, when reduced prices were introduced for dry sticks,—a coolie load being sold for one pice, one hundred loads for Re. 1-6, and a monthly permit for 7 annas. The removal of dry sticks has since greatly increased, showing that a real want existed; for particulars of outturn, see paragraph 157.

The departmental sales of firewood in Darjeeling, though not entirely discontinued in 1883, were greatly diminished. The establishment and other charges could not, however, be reduced on this account, as the trade in charcoal increased and the Department was required to keep a large reserve stock. At the same time, the cost of extraction has increased, as the fellings have extended to more remote blocks; the selling rate having remained unaltered since the 1st April 1887.* Under these circumstances the financial results have been very unfavourable

* Revised rates came into force on 1st October 1891.

to the Department, and the only redeeming point seems to be that the people of Darjeeling have always been able to obtain wood and charcoal at the official price.

Financial results of Departmental fuel operations.

127. The subjoined table has been prepared in continuation of that given in paragraph 23 of the "Memorandum," in order to show, for the whole decennnial period, the profit or loss per 100 maunds of wood, entering charcoal by its supposed equivalent as was done before. It must, however, be remarked that in practice much more than four maunds of wood are consumed to produce one maund of charcoal, even at the kiln; whilst the loss by handling between the kiln and the depôt should also be taken into account. On the other hand, there has been some compensation since April 1887, when the sale by the bag was introduced; as for conversion to maunds, one bag of charcoal is conventionally taken as equivalent to one maund, whereas the weighment of several hundreds of bags gave an average of 66lbs. of charcoal per bag, or 0·8 of a maund only. Charcoal is not, however, sold by weight at the depôt, but by the bag; whilst in the forest the sale of charcoal as such was discontinued in October 1888, purchasers buying the wood and making it into charcoal themselves. The table is based on the total departmental transactions of the Division, and is not confined to the outturn of the Darjeeling and Jalapahar Supply Circles, which had not been formed when Dr. Schlich compiled his statement:—

Financial Results of Departmental Fuel Operations.

Year.	Per 100 Maunds of Firewood.				
	Rate realized.	Expenditure, "A" including loss by dryage, &c.	Surplus.	Deduct share of establishment, being half of total expenditure "B."	Net surplus.
	Rs.	Rs.	Rs.	Rs.	
1880-81 ...	23·23	18·47	4·76	3 72	+1·04
1881-82 ...	20 84	16·80	4 04	3·09	+0·95
1882-83 ...	29·54	21·90	7·64	6 09	+1·55
1883-84 ...	26·33	16 32	10·01	7·30	+2·71
1884-85 ...	26 46	16·51	9·95	6·44	+3 51
1885-86 ...	26·00	20·40	5 60	9 42	—3·82
1886-87 ...	26 19	28·88	—2 69	6 17	—8·86
1887-88 ...	25·94	21·00	4·94	5·59	—0·65
1888-89 ...	27·56	19·52	8·04	5 29	+2·75
1889-90 ...	26 68	20·61	6·07	5 23	+0·84
* Average	25·52	19·49	6·03	5 48	+·55 say As. 8-10 per 100 maunds.
1890-91	26 85	19 05	7 80	3;94	3 86, say Rs. 3-13-9 per 100 mds.

* The average has been calculated from the original data.

The irregularity with which loss has been written off accounts for the fluctuation in the expenditure per hundred maunds, and vitiates the comparison of one year with another. During the earlier years the fuel was obtained not only in nearer forests, but the fellings were concentrated, whereas during the latter half of the decade it has been brought from greater distances and has in great part been obtained by gleaning the dead wood scattered about the forests for the reasons given in paragraph 109.

In 1885-86 the smallness of the outturn was the unfavourable element.

The year 1886-87 was an exceptionally bad one, because in that year loss was written off on account of the three preceding years. Thus the expenditure appears to be particularly heavy under "A" and above the average under "B."

The improvement in 1888-89 is due to no loss being written off, the establishment charges being slightly below the average, and an improvement having taken place in the demand. In 1889-90, on the other hand, the establishment

charges were heavy, considering the large outturn. There was heavy expenditure under head "A" on account of depôt buildings and stores, and at the same time loss was written off to the extent of 18,426 maunds.

A small outturn gives unfavourable results, as in 1885 86; a larger outturn, as in 1884-85 and in 1890-91, tends to diminish the share of establishment charges, and to increase the surplus. Thus the merely *partial* withdrawal of the Department greatly diminishes the surplus or converts it into a deficit; especially when a reserve stock of fuel has to be kept, and fuel establishments, depôts, &c., have to be maintained to the same extent as would be needed for a much larger business.

128. Steps have already been taken to improve matters; whilst the proposals for the future management of the fuel-supply are discussed in part II of this report.

129. Dr. Schlich pointed out ("Memorandum," paragraph 24) that a share of the expenditure on roads ought also to be debited to departmental operations. This has been done in a statement recently submitted to the Conservator by the Divisional Officer, who has taken three-fourths of the expenditure on roads against departmental operations, and obtained the following results (quantities written off as loss being added to the quantities sold, and so reducing the rate realized, whereas in Dr. Schlich's table they are taken in abatement of expenditure):—

Financial Aspect of Departmental Fuel Operations, taking Share of Expenditure on Roads into Account.

Year.	Per 100 Maunds of Firewood.				
	Rate realized.	Expenditure, including defalcation.	Royalty per hundred maunds.	Deduct share of establishment and of roads.	Net surplus
	Rs.	Rs.	Rs	Rs.	Rs.
1888-89 ...	27 42	19·43	7 99	7 34	·65
1889-90 ...	24 15	18 78	5 37	6 04	—67
1890-91 ..	26 70	18 95	7 75	4 10	3 65
* Average	25 95	19 01	6 94	5 59	1·35

130. The Divisional Officer has also furnished a statement for the same three years, showing the financial aspect of transactions with purchasers. This statement exhibits the following results:—

Financial Results in respect of Timber and Fuel removed by Purchasers.

Year.	Timber per 100 cubic feet.			Fuel per 100 maunds.		
	Average price realized	Expenditure chargeable to II*a*.	Surplus.	Average price realized.	Expenditure chargeable to II*b*.	Surplus.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1888-89	10·82	3 71	7·11	6 92	2 39	4 53
1889-90	12 17	4 51	7 66	6 41	2 43	3 98
1890-91	13 45	4·33	9 12	5 73	1·88	3 85
Average *	12 09	4 17	7 92	6 35	2·24	4·11

The expenditure chargeable to revenue under II (Removal of produce by purchasers) includes one-fourth of the expenditure on roads, half of the establishment charges under budget head "B," and any other expenditure directly concerned with the removal of produce by purchasers.

* The average has been calculated from the total figures for the three years

Comparing these results of working by Government agency and removal by purchasers during the last three years, we find—

		Net surplus per cubic foot. Rs. A. P.
Timber	Removed by Government agency ...	... ...
	Removed by purchasers ...	... 0 1 3

		Net surplus per 100 mds. Rs.
Fuel	Removed by Government agency ...	... 1·35
	Removed by purchasers ...	... 4·11

131. As regards timber, the quantity brought to depôt for sale in the Darjeeling Division has been so limited that a fair average surplus per cubic foot can hardly be calculated; but it was formerly the rule to obtain as nearly as possible a surplus of eight annas per cubic foot. Thus Dr. Schlich in the Annual Progress Report for 1877-78, paragraph 35, observes:—"When fixing the prices, the Conservator has throughout been guided by the desire to obtain eight annas per cubic foot clear, irrespective of the cost of permanent establishment, and the result is a net surplus of seven annas, which would be about arrived at by deducting the cost of establishment from eight annas." This result was obtained in the Buxa and Kurseong Divisions. Still it is sufficient to show that the sale of timber at the rates fixed per tree to be removed by purchasers has not been as remunerative to Government as it should have been; and this explains how it was that the finest búk trees, which often contain more than 300 maunds of wood (*See* paragraph 93) were purchased on permit at Rs 15 each, and converted into fuel, when the price of firewood, consisting mostly of scattered pieces of dead and decaying wood, of kinds inferior to búk, was fixed at Rs. 5 per hundred maunds.

132. Fuel removed by purchasers has, on the other hand, yielded a much higher surplus than that removed by government agency, whilst the Forest Officer's time has been taken up by the business of fuel-supply to the detriment of other duties more important as regards the improvement of the estate entrusted to his care. It must further be taken into account that loss by dryage, &c., is not incurred on fuel removed by purchasers, whereas during the ten years 1880 to 1890 it amounted to 7·13 per cent. of the outturn by government agency.

Provisions for grazing.

133. This subject is important, not only from a sylvicultural point of view, but also as affecting the prosperity of the hill station of Darjeeling as a health resort. A brief account of the matter is therefore needed.

About the end of 1864, or early in 1865, all forests the property of Government, above 6,000 feet elevation, were reserved from sale in order to form reserved forests, and reserves were shortly afterwards legally constituted. The grazing of cattle in the forests was placed under the control of the Conservator by Rule III of the Forest Rules, British Sikkim, of the 15th August 1866. (See *Calcutta Gazette* of 5th September 1866, Part I, page 1555.) Extensive sales of waste land for tea cultivation continued, and in 1868 it was noticed that the "receipts from the granting of leases to graze cattle in the reserved forest tracts in the hills were increasing, as tea-planters objected to cattle being grazed on the patches of forest still left on many tea estates. The owners of cattle (Bhutia headmen) therefore preferred to pay for the right of grazing unmolested in the Government forests." (Mr. Mann's Annual Plan of Operations for 1868-69.—*See* Government of Bengal Proceedings, for Jannary 1868.)

Except that damage done by cattle in the Rangbul Plantation necessitated its being fenced in 1874-75, grazing did not become troublesome for several years. The rates for grazing and fodder are the same now as they were in 1877-78, when the Darjeeling Forest Division was formed as a separate charge, viz.—

	As.
Grazing, per head of cattle ...	... 8 per month.
Fodder ticket	. . 8 „ „

Thus, although grazing has not been encouraged as a source of revenue, no attempt appears to have been made to check it by enhancing rates. In fact, the forests were, and still are, happily circumstanced, in that very few cattle are kept for agriculture in their vicinity, and grazing is consequently

almost limited to the milch cattle required for the local supply of milk, butter, and curds.

The construction of the Darjeeling-Himalayan Railway greatly reduced the number of draught cattle, and no suggestions for regulating grazing were made by Sir D. Brandis, whose visit took place about that time (1879-80). With the development of the station, however, the subject soon demanded attention, and was dealt with in Dr. Schlich's "Memorandum" and in the orders of Government thereon. The following arrangement for pasture in the forests was made in 1882, and has been in force until now (1891):—

Forests East of Jorbungalow.

Open blocks.		Closed blocks.		Remarks.
Name.	Area.	Name.	Area.	
Dr. Schlich's "Memorandum" para. 17—	Acres.		Acres.	The intensity of grazing estimated according to the maximum number of cattle allowed to graze at any season is shown thus:—
Takdah	668	Rangnu ...	500	
Senchal 517		Dooteria ...	534	
Tiger Hill 755	2,372	Rangbul ..	650	
Rangjo 1,100		Sepoydhura ...	1,145	
Pachim 468	1,343	Mamrim ...	1,216	
Chattakpur . 875		Sureil ...	900	
Add—Areas opened to grazing by Government orders No. 511 T R., dated the 2nd October 1882—		Rangirum ...	500	
Rangbi	1,037	Dawaipani ..	857	
Sonada	665	Rishap ...	1,062	
		Poomong ...	470	
		Hoom ...	1,060	
Total ...	6,085	Total	8,894	
Area open, per cent.— ..	40.6	Area closed, per cent.	59.4	

	Acres per head.
Senchal block	6
Rangbi and Tiger Hill ...	39
Rangjo	19 3
Takdah	25
Chattakpur	20
General	23·5

Grazing ceased in Pachim block after 1883-84, and in Sonada block no cattle were grazed during 1886-87 and 1887-88. Twenty-five draught cattle were grazed during 1888-89 and five ditto during 1889-90.

Forest West of Jorbungalow.

Open blocks		Closed blocks.		Remarks.
Name.	Area.	Name.	Area.	
Dr. Schlich's "Memorandum" para. 17—	Acres.		Acres.	The intensity of grazing estimated as above is shown thus:—
Balasan	811	Goom ...	600	
Chongtong	1,047	Tungsong ...	653	
Parmaigiri	1,284	Pubong ...	614	
Pagraingbong (part) ...	400	Rishihat ...	835	
Palongdong	931	Rangbong ...	735	
Add—Area opened to grazing by Government orders No. 511T.R, dated the 2nd October 1882—		Pagraingbong (part)	560	
Nai	839			
Total ...	5,312	Total	3,997	
Area open, per cent.—	57	Area closed, per cent.	43	

	Acres per head.
Balasan	18
Chongtong	37·4
Parmaigiri	58·3
Palongdong	22·7
Pagraingbong (part) ...	50
Nai	21
General	28·9

The proportion, taking the two tracts together, was 47 per cent. area open and 53 per cent. area closed.

The average intensity of grazing was 25·8 acres per head.

The grazing question gave some trouble during the period under review. In May 1884 the gwallas threatened to strike, and petitioned the residents of Darjeeling to intercede with Government in their behalf, alleging that a representation made by them to Government the year before had produced no good result. A special meeting was held at the Eden Sanitarium on the 20th May 1884 to consider the milk-supply of that institution. An account of the proceedings was published in the *Darjeeling News* of the 24th May 1884, together with a memorandum drawn up by the Conservator (Mr. Home) replying to the gwallas' petition. The result was that the petitioners were shown to have exaggerated their grievances, and the agitation subsided. At the same time rules were under consideration for submission to Government to regulate grazing in the reserved forests. The rules ultimately passed were published in a notification dated the 10th October 1885, and the cutting of *Phulsari* (Rubus lineatus) for fodder was permitted by a notification dated the 19th November 1885. (*See* Appendix IV.) The grazing rules, though they do not give the full measure of control which appears to the Forest Officer to be desirable and unobjectionable, are still very reasonable. They afford very great assistance in regulating grazing so as to interfere as little as possible with sylvicultural treatment, and they prohibit the grazing of buffaloes, goats, and sheep in the forests to which they apply; whilst rule 4 restricts grazing as far as could reasonably be expected. The number of cattle kept for the milk and butter supply has been only one head per 26·4 acres of pasture available, and the number of cart cattle, barely a third of the maximum (20 acres per head).

The graziers are allowed free fuel, and bamboos, canes, and dry wood for the construction and repair of their "bathans," for which they pay no rent. Poles under 18 inches girth are, if necessary, allowed by rule 7 on prepayment of 4 annas each. (The price at which such poles are sold has lately been reduced to 1 anna and 1 anna 6 pies, according to class.) Fodder for feeding cattle at the "bathan" is allowed free, and to encourage stall-feeding, several small trees, the foliage of which is prized as fodder, have recently been added to the list of fodder plants available for stall-feeding.

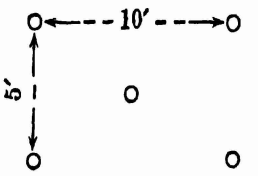
Graziers against whom no forest offence has been recorded for 12 months are allowed to increase the number of their cattle by one-third from the 1st April to the 31st October, *i.e.*, during the Darjeeling season.

Rule 5 constitutes the Deputy Commissioner arbitrator in case of dispute as to the locating of "batháns," and it is customary when any change is to be made in the areas to be opened or closed to grazing to arrange matters in consultation with the Deputy Commissioner. This has been done in the present instance in accordance with the orders of Government.

Works of Improvement—Plantations.

134. The following statement gives an epitome of Plantation works undertaken:—

Name of Plantation and date.	Area.	Species cultivated.	Method of cultivation employed.	Degree of success.
Rangbul (1868 to 1882).	Acres. 281	At first oak, chestnut, and champ (red and white), larch (experimental), and some walnut; cryptomeria seed was sown in 1874-75 and Australian acacias, ash, cypress, pines, and deodar in 1877-79. Silver fir and birch brought from Singalilà. Pipli planted in 1882 (failed).	Planting at stake, vacancies being filled in subsequently. Experiment tried on two acres of raising a crop of potatoes previous to planting. The plantation was opened up by paths, surveyed and fenced in 1874-75. In 1877-78 fuel operations were commenced and the areas cleared were staked out 10′ × 5′ and planted. Sowing seed at stake 10′×5′ was also tried in compartment 7, area 63 acres.	In 1869-70 plants were said to have been browsed by deer and other animals, and nurseries ravaged by field mice and squirrels. Larch failed. Cultivation of potatoes abandoned. In 1872 many plants found to be smothered by weeds and shoots from old stumps. The plantation had been much damaged by cattle. The plants used were too small, and were soon smothered by weeds. Cleanings expensive and insufficient. Germination was only partial; vacancies filled by planting

Name of Plantation and date.	Area.	Species cultivated.	Method of cultivation employed.	Degree of success.
	Acres.		In 1881 planting was done in horizontal bands, 5 feet wide at 25 feet intervals. The plants in the bands were put in three lines— 	This system was satisfactory when large plants were used and cleanings were frequent and thorough. Two cleanings a year were required, viz. at the beginning and end of the rains.
Dooteria (1878 to 1891).	367	Indigenous hill trees and some wattles and coniferæ. Tún in the lower part.	Chiefly planting in lines after clean felling.	Success fair; but frequent cleaning of plants necessitated by the rapid growth of inferior trees and weeds.
Rangnu (1880 to 1885).	139	Ditto without coniferæ. Tún and pipli in the lower part.	Planting in lines, chiefly re-stocking blanks.	On the whole successful. In some parts plants died for want of shelter, and in some cases were smothered by inferior species.
Rangirum (1873 to 1891).	83	At first experimental cultivation of Spanish chestnut interplanted with tún and walnut.	Clearance of the ground and planting 5′ × 5′. Area about 10 acres.	The growth of Spanish chestnut was unsatisfactory. Experiment abandoned in 1877-78.
		Pipli, tún, walnut, and wattles.	Planting in lines cleared through scrub jungle straight down the hillside and the plants put in 5 feet apart.	The wattles failed. Pipli most successful.
Ditto (1888 to 1890).	35½	Champ, oaks, pipli, kawla, and some walnut and cryptomeria.	Planting in horizontal lines under shelter of lofty trees left after improvement fellings.	Promising, failures few, but more numerous (especially of champ and oaks,) where shelter is deficient, and growth of weeds troublesome.
Poomong (1880 to 1888).	205	At first tún was chiefly planted with champ, a few phalát, and pipli. Later, champ, pipli, and oaks were mostly used, with a few tún and auxiliary species.	Planting in horizontal lines cleared through jungle and in some parts under old forest.	General success, though tún suffered from snow. In many parts cleanings have been insufficient. Planting under old forest has not done well.
Tungsong (1880 to 1891).	107	Oaks first planted, then champ, oaks, and katús with some birch near the ridge, and some pipli.	Planting in horizontal lines ...	Good, except in places near the ridge, where plants frequently died. The birch planted here also failed.
Goom (1882 to 1885).	150	Máling bamboo ...	Offsets planted in horizontal lines.	Very good. The máling now affords all the shelter needful for the successful planting of oaks, champ, and other valuable species.
Sepoydhura (1879 to 1887).	24	Chiefly tún at first; pipli, oaks, chestnut, and wattles.	Plants put out in holes or pits in blank spaces.	Repeated failure due to absence of shelter and unfavourable aspect Jhingni sown in 1883-84 to procure shelter for future planting. Plants have grown well where sheltered.

Communications.

135. Sir D. Brandis prescribed that the Goompahar cart-road should be continued so as to tap the adjoining Singalilà forest, and that the cart-road to be made through the Takdah forest should have a branch road, opening out the whole of the Rangbi

block ("Suggestions" paragraphs 44, 45, and 60.) Neither of these important works has yet been commenced; but as a preliminary reconnaissance for the former, a path was made in 1888-89 from Sukiapokri to Manibanjan, a distance of about five miles. It appears that there will be no unusual difficulty in making a good cart-road with a steady descending gradient, probably between 3 and 4 in 100. As regards the widening of the first three miles of the road through the Tukdah forest, see paragraph 175.

In addition to the above extension of export roads, Dr. Schlich directed that a second cart-road should be made in the Goompahar forest along the north face of the hill, to join the road along the south face at Lepchajagat ("Memorandum," paragraphs 4 and 16). This work was also taken up experimentally in 1888-89, and the Nai-Rishihat path was made in order to prospect for a line near the lower limit of the forest, so that the road might be of service to neighbouring tea concerns and other estates drawing supplies from the reserved forest. Difficult ground was, however, met with, and as the Soom Tea Company objected to a road being made through their land, this line was abandoned, and a commencement made the next year from the Goompahar neck.

Dr. Schlich also recommended that if the departmental supply of fuel was continued, a tramway should be laid on the new road from the Goom railway-station to the Goompahar neck, and that a central fuel depôt should be established at this place. The depôt was established and the departmental supply continued, but no tramway was laid. The idea seems to have been abandoned in 1883-84 (See Annual Report, paragraph 195), and wisely so, as the gradient 1 in 25, which is very steep for rails, is against the load the whole way, and the distance from Goompahar to Darjeeling is so short that no great saving could be expected. Terms would, moreover, have to be made with the Darjeeling-Himalayan Railway Company to carry the produce into Darjeeling over their line; and, in reply to enquiries recently made, the Board of Directors have intimated that "the Company does not see sufficient inducement to make special arrangements to carry in the fuel" (General Manager's letter No. G2163, dated $\frac{20th}{30th}$ May 1891, to the address of F. B. Manson, Esq., Deputy Conservator of Forests, Working Plans Division).

The Goompahar Cart-road, commenced by the Forest Department, was extended by the Public Works Department as far as Gairibash by the end of 1888-89, a distance of nearly ten miles from the Darjeeling-Himalayan Railway Station at Goom. It is a very good carting road, but is rather too narrow. A width of 15 feet would have allowed two carts to pass one another safely at any point on the road, which is hardly the case now. Moreover, on the section west of Lepchajagat, out of the total width of about twelve feet, a strip eight feet wide only has been soled and metalled. This is a great pity, as the outer unmetalled portion is much cut up by traffic and worn away, reducing the width of the road. As regards the suitability of the road for laying a tramway line, the gradient could be improved by taking a line direct from Sukiapokri to Goompahar neck instead of going over Lepchajagat. In fact, the allignment is not the most suitable for tapping the forest on the Goompahar range seeing that it is as nearly as possible on the top of the ridge, and that produce to be delivered on it must be hauled up 1,000 or 2,000 feet; but it is important as a trade route to Nepal and the best line of export at present available for tapping the extensive forests of the Singalilà hills, which are extremely difficult of access from Darjeeling owing to a series of ridges and deep valleys intervening.

Excepting the Goompahar cart-road, very little was done by the Forest Department during the period under review to open up the forests until 1888-89, as shown in the following statement. In some cases the opening up of old paths, which had formerly been abandoned, has been shown in the Progress Reports as new work. These lines are no doubt better than none, but they were not alligned with a view to bringing the produce of the forests to market, and are not adapted for cart traffic: they are mere inspection paths.

Dr. Schlich considered that it would be absolutely necessary to spend as much as Rs. 5,000 a year on the construction of roads for a number of years, ("Memorandum" paragraph 24). During the ensuing nine years the expenditure ranged between Rs. 425 (1885-86) and Rs. 3,991 (1888-89). The expenditure

charged during 1885-86 was Rs. 5,062, but of this sum Rs. 4,637 was a deferred payment for work done during 1881-82.

Road-work from 1880 *to* 1890.

Year.	Description of new work.	Length in miles.	Cost.
			Rs.
1880-81	Goompahar Cart-road only		
1881-82	,, ,, ...		
1882-83	Rangnu block—Inspection path, since abandoned	2½	549
1883-84	Nai ,, ,, ,, an old path reopened	4	455
,,	Mamrim ,, ,, ,, ,, ...	3½	215
1884-85	Tiger-Hill—Inspection path, zigzags up ridge	3	...
,,	Rangbul-Sonada—Inspection path from Senchal to Old Military Road, an old road reopened	4	...
1885-86	No new works. Rs. 4,637 spent on Goompahar cart-road in 1881-82 now debited as a final payment	...	...
1886-87	A few short lengths of path leading from the main roads to inspection bungalows	1¾	55
1887-88	Palongdong—Bridle path from Sukia Pokri to the boundary of forest on Palongdong ridge	1½	148
,,	Sepoydhura block—Inspection path from the Forester's house to the nursery	1	37
1888-89	(*i*) Sukiapokri to Ranichuten on Nagri ridge, gradient suitable for a cart-road	8	1,061
	(*ii*) Palongdong - Inspection path near south boundary with easy gradient	3½	423
	(*iii*) Sukiapokri to Manibanjan—Preliminary trace to be realigned so as to avoid rocky ground and do away with zigzag	5	222
	(*iv*) Manibanjan to Majua spur in Singalilà forest—An inspection path, incomplete	2	416
	(*v*) Nai-Rishihat—Inspection path preliminary trace since abandoned on account of rocky ground	6	402
	(*vi*) Rungirùm block—Inspection path with good gradient, incomplete ...	4	446
1889-90	Expenditure on account of previous year (*i*) Rs. 179, (*iii*) Rs. 329, (*iv*) Rs. 157, (*vi*) Rs. 369	...	1,034
	Road trace—North side of Goompahar Range, incomplete	1	102*
	Sukiapokri-Ranichuten road—Widening 4 miles 801 feet	...	423†
	Lepchajagat-Majdura—Inspection path, incomplete	2	123
	Majdura-Sukiapokri ditto ditto	1	41
	Gairibash to Sukia-Manibanjan trace, complete	½	31
1890-91	Road trace—North of Goompahar Range, deferred payment	...	47

* Out of Rs. 750 sanction received on 18th March.
† Out of Rs. 600 sanction received on 10th March.

Buildings.

136. The works of a permanent nature done under this head from time to time are as follows, taking them as far as possible in the order in which they were built or acquired. The cost includes enlargements, but not the ordinary repairs, and does not include the value of the timber :—

Rangbúl—plantation bungalow, small, wooden; cost Rs. 500; kitchen and stable added in 1880-81; cost Rs. 150; is now old and past repair, and will be pulled down.

Rungirùm—inspection bungalow; "pucka;" 4 rooms; acquired 1878-79, together with land (75 acres) which formed the old Botanical Garden; cost not known.

Goompahar—ranger's house; built 1878-79; cost Rs 500; is within Municipality; rates Rs. 36 per annum (payable quarterly).

Darjeeling Bazar—upper fuel depôt; two stories; planked walls; roof of sheet-iron; built 1878-79; cost Rs. 1,107; site leased from the Maharaja of Burdwan, known as the Tarikabad location; area 5 poles; present annual rental Rs. 80, payable quarterly; lease expires January 12th, 1892, with option of renewal for five years at the rate of rent then in force in the neighbourhood; storage capacity of upper floor 1,850 bags of charcoal; of lower floor 600 bags.

Darjeeling Bazar—lower fuel depôt; masonry foundations and pillars, wooden superstructure; battened walls; roof of corrugated iron; originally built in 1880-82 on site of present meat-market at cost of Rs. 2,979; removed to present site at Laldighi below Charitable Dispensary ir 1883-84, at cost of Rs. 1,269; revetment walls built in 1884 85 and 1886-87; cost Rs. 622; area of site 16·8 poles; leased from Municipality; annual ground-rent Rs. 102-8;* rates Rs. 114 (payable quarterly); lease expires 30th September 1895, renewable for ten years at Rs. 8 per pole; the

(* Originally Rs. 80.)

building was entirely reconstructed and enlarged in 1889-91 at a cost of Rs. 6,890, as follows:—

	Rs.
The building	5,726
Retaining walls, &c.	1,164
Total ...	6,890

The upper floor is divided into nine compartments, in which charcoal is stored; capacity 900 bags in each compartment; the lower floor will hold 148 cords of firewood and 1,900 bags of charcoal.

Goompahar—charcoal godown with stable; built 1880-82; cost Rs. 410; annexe of ditto 1886-87; cost Rs. 414; new godown, 1887-89; cost Rs. 423.

Lopchu—inspection bungalow; built 1880-81; cost Rs. 1,700; kitchen and stable built, 1882-83; cost Rs. 345; the stable built on khas land by permission of the Deputy Commissioner (*vide* Annual Report for 1882-83, paragraph 275).

Lepchajagat—inspection bungalow; built 1882-84; cost Rs. 1,910; repairs and alterations during 1885-86 brought the total to Rs. 2,000.

Takdah—forester's house at third mile, Sureil road; built 1885-87; cost Rs. 750.

Tonglu—ranger's house; built 1885-86; cost Rs. 650; roofing with sheet-iron, and building a kitchen (1886-87); cost Rs. 250. Total Rs. 900.

Chattakpur—rest-house for the range officer, wooden; built 1885-86; cost Rs. 160.

Pachim—inspection bungalow, wooden, with chimney; built 1886-88; cost Rs. 1,300.

Sepoydhura—rest-house for range officer; built 1885-86; cost Rs. 140.

Sukiapokri—charcoal godown, wooden, with roof of sheet iron; built 1888-89; cost Rs. 331; will be converted into a forester's house.

Palongdong—rest-house for range officer; built 1888-89, wooden, with shingle roof; cost Rs. 116.

Manibanjan— ditto, ditto; cost Rs. 121.

Hoom— ditto on Rangli-Rangliot spur; built 1889 90; cost Rs. 229.

CHAPTER X.

INJURIES TO THE FOREST AND THEIR PREVENTION.

Fires.

137. The jungle is occasionally set on fire by sparks from the Darjeeling-Himalayan Railway engines, and small patches of dry weeds are burned in this way. The burning of litter in fields adjoining the forest is also a source of danger. But on the whole the tract is happily situated in respect of fires, the climate is very moist, drought is comparatively rare, and fires do not occur every year. When they do penetrate into the forest, however, their effect is particularly damaging, as was pointed out by Mr. Gamble in the following words:—

"The damage done by fires in these hill forests is, compared with those in the plains, comparatively greater. The thin-barked oaks, chestnuts, and magnolias suffer much more than the thick-barked sâl, saj, and chilauni, while the heavy masses of dry moss on the branches of the trees attract the fire to the tops and smoulder long, the result in most cases being the death of the tree." (Annual Report, 1878-79, paragraph 55).

It is, therefore, very necessary that precautions should be taken against fire, and it would be advisable to have a good system of paths established, both near the boundaries and also within the forests, so that in very dry seasons the fire lines may be readily cleared along them and patrols be able to traverse the lines quickly, in order to repel a threatened invasion of fire at any point.

In the old annual reports it is recorded that fires only occur about once in twenty years. Thus when, in 1876, a fire occurred in the Rangbul block and was with difficulty kept out of the plantation, it was remarked that if report were true no jungle fire had been seen so high up (7,500 feet above the sea)

for at least twenty years. (Annual Report, 1875-76, paragraph 74.) The subsequent record has not confirmed this tradition, nor does it support the view that fires do little harm in these hill forests. The effects of the Rangbul fire are recorded thus:—"The forest growth was so seriously damaged by a forest fire in 1876, and afterwards by grazing, that replanting is necessary." (Annual Report, 1880-81, paragraph 62.) "The fire of that year had killed nearly every tree and left the ground bare, with tall dry stems standing up in it." (Annual Report, 1881-82, paragraph 69.)

In 1878-79 the winter and spring were exceptionally dry, and extensive fires devastated the Singalilà forest, which was not at that time reserved. When the locality was visited in the autumn of 1879 by the Inspector-General of Forests and the Conservator, "the whole of the forest, from the summit of Tonglo to the police-station at Kinjalia, was found to have suffered, the thin-barked rhododendrons and oaks having in many cases been completely killed." (Annual Report, 1879-80, paragraph 32.) In the same report it was noted that the supply of cane had run short to such an extent that "even far in the interior of Sikkim, owing to its having been destroyed by the fires of 1879, cane for the Tista and Great Rangit bridges was almost unprocurable, whilst the cost of the mats universally used in the hills for roofing purposes increased greatly owing to the destruction of the bamboos in the Singalilà forest." In this forest fire again occurred in 1881-82, and is noticed as having been the most disastrous fire of that year. "Perhaps the greatest piece of damage done by fire during the year," says Mr. Gamble, "was the burning of a large area of the Singalilà range in Darjeeling, at the elevation of 10,000 to 12,000 feet, before the forest was taken over. On the fire being noticed steps were taken to extinguish it, but considerable damage was done to the forest of silver fir."

The fir forest now presents indeed a deplorable appearance. Such extensive fires have not since happened, but no system of protection has been developed so as to be in readinesss for an emergency.

Wind.

138. Violent storms of wind are almost unknown. High winds mostly prevail in the spring, when they usher in the summer monsoon. Though not a serious cause of injury, some damage may be done by them to blossom or immature fruit. This is unavoidable. Branches are broken off and trees occasionally blown down, but it will generally be found that the branch or tree was unsound. This cause of damage can be removed to a great extent by the removal of decaying trees. The breakage of trees by snow or hail, which is more serious, has been mentioned in paragraphs 43, 44.

Frost, snow, and drought.

139. A few instances have been recorded of seedlings in plantations having suffered from these effects, but it would seem that in these cases the plantations were made on blank areas or land that had been cleared of forest, so that there was insufficient shelter for the plants. In some cases the damage was attributable to the planting having been done too late, to the planting of species above their natural limit, or to the use of too young plants. These are matters which can be easily remedied.

Floods and landslips.

140. Situated on the summits and upper slopes of hill ranges, the forests are not liable to floods, yet the torrential rush of water in the mountain streams by undermining their banks sometimes occasions landslips. These are not so noticeable in the forests as outside, and in the former case the ground is usually soon covered with jungle, several useful kinds of trees coming up especially well in such places; for example, pipli, tún, utis, birch, Pieris ovalifolia, and some others.

Offences against the Forest Regulations

141. Such offences are neither numerous nor serious. The lopping of trees by graziers has given some trouble in the past; but of late years very few such cases have been detected; and in the course of the operations connected with the preparation of this working-plan, the only trees found to be lopped were those which under the grazing rules are allowed to be lopped. The improvement is doubtless due to those rules and to the concession made, with effect from the 1st June 1887, in favour of graziers who for twelve months have not compounded, or been convicted of any forest offence—the concession, namely, of allowing them to

graze one third more cattle during the Darjeeling season (1st April to 31st October) than they would otherwise be entitled to graze.

There is not a large agricultural population near these forests, and consequently the grazing question is not nearly so troublesome as it is in most districts in India. The difficulty is, however, relatively great, because the area of the forests is restricted and the demand for timber and fuel considerable. These considerations make it important that reproduction and the growth of the young forest should be as little interfered with as possible. The grazing has therefore been wisely restricted by the Grazing Rules, as explained in paragraph 133. Cattle-trespass takes place at comparatively few points, as the lands adjoining the forests are for the most part tea estates and the Government cinchona plantations. There are a few blocks of Government khas land on the borders of the forest, and it is chiefly at these points that trouble is experienced through cattle-trespass. Bathán̄s are established close to the boundary of the reserved forest, and the tracks of the cattle are found in the forest converging to these bathán̄s.

The damage caused by the proximity to the forest boundary of the bathán̄s situated on khás land has been pointed out to the Deputy Commissioner, and his aid has been sought with a view to their removal to a reasonable distance from the forest boundary.

Pounds.

142. The following pounds are sufficiently convenient :—

For the Goompahar forest, Sukia Pokri and Jorbungalow, and for the rest of the tract, Rangli-Rangliot, Jorbungalow, Sonada, and Kurseong.

Damage done by wild animals.

143. The damage done by wild animals is rarely noticeable. Bears do a little damage by clawing the thin bark of some trees ; they eat the fruit of some important timber trees, such as oaks and lepchakawla, but they also assist in the dissemination of kharán̄i, the seed of which, being small, is voided uninjured. Rats and squirrels do damage in nurseries, but on the whole their ravages are insignificant. Birds are rather useful than injurious : they assist in re-stocking blanks by the distribution of seeds, such as arupati, bás̄ak brambles, &c., whilst the damage they do is probably limited to the spread of seeds of noxious weeds, epiphytes, and parasitic plants.

Climbers.

144. It has been asserted that climbers do little or no harm in these forests, but this is not quite correct ; for, although the stems of the trees are less liable to become deformed by climbers here than in the lower hill forests, still certain climbers are troublesome, and in two ways :—*firstly*, in young growth, where they smother and deform many young saplings, and, *secondly*, in mature forest, where their stems, extending from the crown of one tree to another and binding them together, cause considerable damage when the trees are felled. The remedy in the former case lies in timely cleanings, and in the second in cutting the climbers a season or two before the felling is to take place. As far as practicable, climbers should be cut whilst their fruit is unripe. The following note on the climbers which are most troublesome in the two cases has been furnished by Mr. Haines :—

" The climbers most injurious to large trees are *Mucuna macrocarpa*, *Embelia Gamblei*, and *Stilbanthus scandens*. All these attain a girth of 1 to 2 feet, and sometimes more. *Mucuna macrocarpa* from its spreading habit, exceeding vitality, and ready reproduction from seed is perhaps the most difficult to eradicate. One plant seldom confines itself to a single tree, but sends strong thick branches into all the surrounding trees, and, by binding them fast together, is often the cause of a considerable blank when a tree is felled. In other cases it often prevents the fall of trees which have been cut. It is exceedingly common in the poorer parts of the forest, as it apparently requires light when young, and in such forest it often causes saplings to die or become crooked owing to the shade of its foliage and the weight of its branches.

" *Embelia Gamblei* is especially common about 7,000 feet. It has dense persistent foliage and pendulous branches, which, however, do not so often bind one tree to another as *Mucuna macrocarpa* does.

" *Stilbanthus scandens* is harmful both to large trees and young growth. In its habit of growth it adapts itself to its surroundings. In the vicinity of large trees it will reach the topmost branches and entirely cover the crown of the tree with its foliage. It also has long, pendent branches, but they are not

very strong. In partially cleared, and especially in damp situations, it forms a dense and tangled growth. Reproduction becomes impossible, unless it is cut back wherever it appears. This climber is easily recognized by its square branches and opposite leaves, and the nodes of the stem being swollen.

"*Vitis himalayana* and *V. rumicisperma* are both huge climbers. Their leaves, however, are deciduous, and they are bare for a considerable time, and thus less harm is done than in the case of the previous species. Their leaves form a good fodder and the fruit is sweet, the seeds probably being disseminated by birds. Another deciduous leaved large climber is *Premna interrupta*, which, as well as the above, should be cut. *Pentapanax racemosum*, *P. Leschenaultii* and *Heptapleurum venulosum* are also large climbing shrubs, but are not so common as the others.

"Of the climbers that do most harm to young growth besides *Stilbanthus scandens*, *Mucuna macrocarpa*, and occasionally species of *Vitis*, the most common are *Polygonum paniculatum* and *P. chinense*, the former climbing to twenty or thirty feet, and the latter having numerous leaves and thin wiry stems which ramble over the ground and smother the young seedlings. Plants excessively troublesome in light, damp places, forming a matted covering over low vegetation, are the yellow-flowered curcurbitaceous plant *Herpetospermum caudigerum* and the white and pink-flowered, succulent *Streptolirion volubile*, both herbaceous and difficult to eradicate. Rambling and climbing species of *Rubus*, such as *R. paniculatus*, often do considerable damage to young growth, whilst the following are troublesome when planting has to be done in scrub and second growth forest:—

"Shrubby species	...	*Sabia leptandra.* *Senecio araneosus.* *Thunbergia coccinea.* *Toddalia aculeata.* *Embelia floribunda.*
"Herbaceous species	...	*Crawfurdia japonica.* *Campanumea inflata.* *Rubia cordifolia.* *Holbœllia latifolia.*

Epiphytic plants.

145. Epiphytic plants are numerous, and do considerable damage by causing breakage of branches and consequent decay of the tree, besides the injury done to other trees by the fallen branches. Those epiphytes which grow on the highest branches and afford increased lodgment for snow, hail, and water are the most objectionable, but in dry seasons the accumulation of decayed material, dry moss, &c., on all parts of the tree is a serious danger in case of fire. The removal of decaying trees and the protection of the forest from fire seem to be the only remedial measures that can be adopted.

Parasitic plants.

146. Parasitic plants, such as *Viscum* and *Loranthus* are not so abundant as to cause serious injury, but they have much the same effect as epiphytes, and trees very much infested by them should be removed.

Weeds.

147. The luxuriant growth of weeds may be a serious cause of loss by deferring for many years the growth of any valuable forest trees; and this source of injury may result from or be aggravated by injudicious treatment. When clean fellings are made or large gaps formed, seedings of valuable species rarely appear; the ground is usually invaded by weeds, brambles, and inferior trees, or in great part becomes covered with turf. Dr. Schlich in his memorandum No. C. 10, dated the 24th January 1873, pointed out that it is a mistake to make entire clearings in these upper hill forests, as was done at Rangbul when the Department began operations. The result was that the restocking of this part of the forest was extremely costly. When Dr. Schlich inspected the plantation it was found that herbaceous plants and shoots from old stumps formed a thick cover which had smothered many plants. This plantation is still the least satisfactory, though it has been more expensive than any other. The same lesson was learned at Poomong, where almost entire clearances were made for the supply of charcoal to the Gielle tea estate. The scrubby inferior vegetation, found especially on southern and western slopes, where cultivation was abandoned

twenty-five or thirty years ago, shows how much time may elapse before the ground at those aspects is covered with forest of any value.

Dead and decaying trees.

148. The great number of hollow and decaying trees is a cause of loss and injury, not only on account of the increment being added to deteriorating stock, but also owing to the damage done by the fall of such trees. Many of them have immense spreading crowns which do damage by suppressing the younger trees beneath them. The removal of these large trees will be effected by amelioration fellings.

Injury done by human agency.

149. The cutting and hacking of trees is common, owing to the fact that almost every Paharia coolie carries a 'kukri.' Notches are cut in the trees for climbing; trees are blazed by sawyers and others to mark their path through the jungle; or wanton damage is done by a thoughtless coolie simply to try the edge of his kukri. The remedy is obvious.

Injurious insects.

150. We are hardly in a position at present to deal with injurious insects; and in these forests, owing to the great variety of trees, the ravages of insects are less serious than in forests which are pure or consist of two or three species only. A flight of locusts appeared in Darjeeling on the 18th July 1891, and remained in the neighbourhood fully a month. They kept circling round, and seemed to have a difficulty in finding their way out of the valley. The damage done by them to the forest trees does not appear to have been serious, though young plants suffered in some of the nurseries. The same may be said of the swarms of processional caterpillars which were noticed last year. The búk and some other trees were to a great extent attacked, whilst the Lauraceæ and Magnoliaceæ were not. In the dry weather work in the forest became exceedingly unpleasant on account of the irritating hairs of these caterpillars.

Enclosures of private lands.

151. No trouble has been experienced in this connection; but recently a location called 'Clover Bank,' situated at Senchal and leased to Mr. William Lloyd for 99 years, with effect from the 1st January 1860, was put up for sale for arrears of revenue (Rs. 25), and sold in September 1891, by auction, for Rs. 705, the purchaser being Pargan Ram, a shopkeeper of Darjeeling. The area of this location is not stated in the lease nor in the records of the Deputy Commissioner's office. The boundaries are stated in such an indefinite manner that it is impossible to lay them down from the description given, and there is no trace of any boundary mark on the ground. The Deputy Commissioner should be asked to decide what is the area of the location and to lay down the boundary. In the absence of any evidence to the contrary, the presumption is that the area is 5,000 square yards, or about one acre, as rule 15 of the rules for regulating the assignment of these building locations (passed on the 4th September 1839) fixed the maximum area at 100 yards square, for which an annual rental of Rs. 50 was charged on a lease for 99 years.* 'Clover Bank' would seem to have been a half-size location, the rent being Rs. 25. It would be advisable to acquire the land, and provision should be made for this. It is understood that the purchaser is at present willing to sell for the price he gave. If not acquired, steps should at once be taken to exclude the location from the reserved forest.

* See note appended to the rules.

The forest staff.

152. One officer of the upper controlling staff at present manages the Division. His work is arduous, not only on account of the mountainous character of the country and the straggling distribution of the forests (of which the elevation varies from 600 feet in the Tista valley to nearly 12,000 feet on the Singalilà range), but also on account of the want of training of the executive officers which prevents that trust and reliance being placed in them, which officers of the Public Works Department, for instance, can repose in their subordinates. Thus, the divisional officer feels constrained to undertake all important executive duties, because he knows that loss both of time and money, and in some cases the future ruin of the forest, would result if he entrusted them to his executive staff.

The divisional officer's time and energies are, moreover, expended to a great extent in conducting the business of fuel supply in the station of Darjeeling

and thus the forest officer has insufficient time to devote to his more legitimate professional duties. He has no leisure for the training of his subordinates—a very important and necessary duty.

The growth of the Darjeeling town, the large increase in the European population since the Darjeeling-Himalayan Railway was opened, and especially the development of the tea industry, have brought about a wide-spread demand for forest produce, and it is undoubtedly in some measure due to the unavoidable delay in attending to the business of customers that there is a tendency to avoid dealings with the Forest Department so long as supplies can be obtained from other sources. The importation of ready-made tea-boxes from Japan, the gradually increasing use of coal and water-power, the importation of charcoal and timber from Sikkim into Darjeeling and many tea gardens, are all indications of a loss of custom, whatever the cause may be. It is quite certain that the forest officer in charge of the Darjeeling Division cannot properly do the work of another Division in addition to his own, as he has frequently been required to do in the past. The controlling staff is certainly inadequate to perform well the duties now required,* and this inadequacy causes a direct loss of revenue by means of a loss of custom.

* NOTE.—It is, however, hoped that the final abandonment of the direct supply of fuel may soon be achieved

The executive and protective staff.

153. The strength the establishment, according to the scale recently proposed by the Conservator, is as follows:—

Forest rangers	...	...	... 2
Foresters ...	...	...	... 6
Forest guards	...	...	... 35

and the table below shows its distribution.

WESTERN RANGE.

EXECUTIVE STAFF.	PROTECTIVE STAFF.		
Ranges.	Rounds.	Beats.	
WESTERN RANGE.	GOOMPAHAR ROUND.	No. AND NAME OF BEAT.	No. OF FOREST GUARDS.	STATION.
Officer ... ... 1 Ranger.	Officer .. .. Range officer temporarily in charge.	1. Tasiding .	2	1. Goompahar. 2. Lepchajagat.
Head-quarters Goompahar.	Head-quarters .. Goompahar.			
Forests comprised in the range. Goompahar .. 14 Singalila . 64	Blocks comprised in round. Goom, Nai Rishihat, Tungsong, Pubong, and Balasan.	2. Posambing ...	2	1. Goompahar. 2. Lepchajagat.
Area of range in square miles 78	Area of round in square miles 7			
	SUKIA ROUND.			
	Officer ... ... 1 Forester.	1. Mim ..	2	1. Sukia Pokri. 2. Manibaujan.
	Head-quarters ... ... Sukia Pokri.			
	Blocks comprised in round. Chongtong ... Parmaigiri ... Rangbong ... Pagraingbong ... Palongdong ...	2. Nagri ...	2	1. Sukia Pokri. 2. Ranichuten.
	Area of round in square miles 7			
	SINGALILA ROUND.			
	Officer ... ... 1 Forester.	1. Phalut ... (N. of Sandukphu spur).	2	Phalut.
	Head-quarters ... ... Tonglu.			
	Forest comprised in Singalila round.	2. Rimbick ... (N. of Gairibash and Lodhoma river).	2	Rimbick.
	Area of round in square miles 64	3. Tonglu ... (S. of Gairibash and Lodhoma river).	1	Tonglu.

Eastern Range.

Executive Staff.	Protective Staff.		
Ranges.	**Rounds.**		**Beats.**
Eastern Range.	**Senchal Round.**		No. and name of beat. / No. of Forest Guards. / Station.
Officer ... 1 Extra Assistant Conservator in charge.	Officer ... ... Range officer in charge assisted by the Forester of Takdah round.		...
	Head-quarters ... ... Sureil road.		1 Rangirum ... (Periodic block I). / 2 / Rangirum.
Head-quarters... Jorbungalow ...	Blocks comprised in the round.	Sq. m.	2. Rishap ... (Periodic block II and bara Senchal). / 2 / Rangbi spur.
Forests comprised in the range. Sq. m. Senchal 5; Mahaldaram 7; Takdah ... 12; Rangit ... 6; Mangwa ... 1½; Raiang ... 6; Berrik 2	Rangirum, Dawalpani 2½; Senchal ... ... 1; Tiger Hill ... 1; Rangjo ... ... 2; Rangbi ... ... 1½; Rishap ... ... 1½; Rangnu ... Dooteria ... 1½; Pachim and Rinchingtong Dhara, N. and S. 1; Rangbul ... ... 1; Sonada 1		3. Rangjo ... (Periodic block III). / 1 / 3rd mile.
Area of range in square miles 39½	Area of round in square miles 14		4. Sonada ... (Periodic block IV). / 2 / Sonada.
	Mahaldaram Round.		5. Jorbungalow (Periodic block V and Senchal pasture). / 2 / 1. Rangbul. 2. Range Head-quarters.
	Officer ... ... 1 Forester (on temporary establishment).		West ... ... (Periodic blocks III, IV, V). / 2 / 1. Toong. 2. Chattakpur.
	Head-quarters ... ... Toong.		...
	Blocks comprised in the round.	Sq. m.	East ... ... (Periodic blocks I and II and Chattakpur ridge.) / 2 / Mamring turning (8th mile).
	Chattakpur ... 1½; Sepoydhura ... 2; Mamrim ... 2; Sureil 1½		Sureil spur ... / 1 / Labdah road.
	Area of round in square miles 7		...
	Takdah Round.		1 Poomong ... (Periodic block I). / 1 / Poomong nursery.
	Officer ... ... 1 Forester.		...
	Head-quarters ... ... Rangli-Rangliot.		2. Hoom ... (Periodic blocks II, V). / 1 / Head-quarters of round.
	Blocks comprised in the round.	Sq. m.	3. Takdah ... Periodic blocks III, IV). / 1 / Lopchu.
	Poomong ... ... ½; Hoom ... ... 1½; Takdah 1		1. Badamtam .. / 2 / Badamtam.
	Area of round in square miles 3		2. Mangwa ... / 1 / Head-quarters of round.
	Tista Valley Round.		3. Raiang ... / 2 / Raiang bridge.
	Officer ... . 1 Forester.		
	Head-quarters ... ... Tista bridge.		
	Forests	Sq. m.	
	Rangit ... ... 6; Maugwa ... ... 1½; Raiang 6		
	Area of round in square miles 13½		

153 As the full strength of this establishment has not yet been sanctioned by Government, it is impossible to judge of its adequacy. The object has been to divest foresters of the executive functions and responsibilities of range officers which they have hitherto discharged, together with the opportunities and temptations which are inseparable from that position of trust, and to which it is thought men of the forester class cannot fairly be subjected. The status, pay, and responsibilities of range officers have been raised, whilst the number of posts has been reduced and the area of ranges increased. It remains to obtain competent men, well trained, and sufficiently energetic to carry out the increased work better than was done under the old regime. There are very few of the old range officers qualified for such advancement, and the supply of suitable men from the Dehra Dun School is insufficient.

Under the new organisation the clerical work devolving upon range officers reduces their usefulness, and it will be cheaper to provide them with clerks, when clerical work becomes heavy than to insist on their doing this work themselves, because there is much greater risk of fraud and loss through

neglect of supervision in the forest than in the office. The material standing in the forest is the principal object to be safe-guarded, and this is far more difficult to control than money, cash accounts, and returns of produce.

There is little difficulty in obtaining men who can keep accounts and conduct the ordinary routine of office work. The difficulty is to obtain trustworthy men with a taste for forest work, and possessing the necessary qualifications and training. At present, not one of the rangers or foresters serving in the Division is competent to survey a 'coupe' or to lay out a path in these hill forests, whilst all are equally in need of training in sylviculture.

Temporary establishment.

154. Temporary establishment is chiefly entertained for the management of departmental fuel works, but also for the construction and maintenance of roads, for plantations, and to superintend the removal of produce by purchasers.

The range officer's peons have hitherto been classed as forest guards and included in the permanent establishment, the object being to give them legal powers under the Forest Act, and in this indirect way to add to the strength of the protective staff. The principle here followed seems to be wrong, and it is suggested that in future these men be provided for on the temporary office establishment.

Temporary establishment at present sanctioned.

Departmental fuel operations—* Budget sub-head AIb.				Removal of produce by purchasers—Budget sub-head AII.				Road works—Budget sub-head AVIIc.				Plantations—Budget sub-head AVIIId.				Miscellaneous—Budget sub-head AIXc.			
Designation.	No.	Pay.	Cost.	Designation.	No.	Pay.	Cost.	Designation.	No.	Pay.	Cost.	Designation.	No.	Daily pay.	Monthly cost.	Designation.	No.	Pay.	Cost.
		Rs.	Rs.			Rs.	Rs.			Rs.	Rs.			As.	Rs.			Rs.	Rs.
Fuel-forester ..	1	25	25	Forester ...	1	25	25	Beldar ...	1	10	10	Mali ...	6	4 each.	46	Garden mali and chowkidar.	1	10	10
,, chaprasis	2	12	24	Personal peon	1	8	8	...	...	...	...	...	...	...	...				
,, ,, ...	2	10	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
,, ,, ...	6	8	48	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Monthly maximum.	...	...	117	...	...	...	33	...	...	...	10	...	...	...	46	...	...	...	10

* NOTE.—The existing practice is to charge this establishment under AII which is certainly improper. Total monthly cost of temporary establishment Rs. 216.

CHAPTER XI.

THE PRODUCTS YIELDED.

Summary of outturn of the past ten years.

155. The outturn during the past ten years of timber and fuel from the forests specially treated in this report is summarised as follows with reference to the agency of exploitation:—

Outturn of Timber and Fuel (1880-1890.)

AGENCY OF EXPLOITATION.	OUTTURN OF TEN YEARS—1880-1890.					
	Timber.		Fuel.		Timber and fuel.	
	Quantity.	Per cent.	Quantity.	Per cent.	Quantity.	Per cent.
	C. ft.		C. ft.		C. ft.	
Government agency ...	33,148	2·6	2,780,686	53	2,813,034	43·4
Purchasers	1,191,809	97·0	2,466,031	47	3,657,840	56·5
Free grantees	5,212	0·4	469	Nominal	5,681	0·1
Total ...	1,229,169	100	5,247,386	100	6,476,555	100
Average ...	122,917	...	524,739	...	647,655	...
1890-91.						
Government agency ...	1,053	1	408,130	61	409,183	51
Purchasers	127,509	99	260,758	39	388,267	49
Free grantees	950				950	
Total ...	129,511	100	668,888	100	798,399	100

The outturn consists chiefly (81·2 per cent.) of fuel; the supply of timber is deficient, and has long been so. This was pointed out by Mr. Chester himself in paragraph 22 of his draft working plan, where he put at 100,000 cubic feet a year, the demand for timber which could not be met; a demand which is steadily increasing. The fact has, moreover, been repeatedly stated in official reports that these forests were being steadily overworked as regards sound timber. Mr. Chester's assertion that they should be managed principally for the supply of fuel was, therefore, rather misleading; and this no doubt accounts for the opinion formed by the Inspector-General of Forests, and stated in his note of the 11th December 1888, to the effect that too much fuss had been made about the Darjeeling working plan, and that there was more material available than required for a station twice the size. It accounts also, no doubt, for the strong impression that has been entertained that the coppice method of treatment would be most suitable, an impression which the writer was called upon to dispel. The statistics given in this Chapter show that, whilst the market for fuel is of the utmost importance in the present condition of these forests, the interest of the proprietor is to grow as much timber of the best quality as possible.

156. The free grants have been quite insignificant, and there are no right-holders.

Outturn removed by government agency

There has been no outturn removed by government agency from the Singalilà forests.*

We have therefore to consider (*a*) the tract specially treated, and (*b*) the Singalilà forests.

First, as regards (*a*) the following statements exhibit—

I—Outturn removed by Government Agency.

Year.	Timber.	Fuel			Total timber and fuel	Remarks
		Firewood	Charcoal.	Total fuel		
	C ft	C ft	C ft	C ft	C ft	
1880-81	4,391	259,171	80,976	340,147	344,538	Charcoal is represented by its equivalent in wood.
1881-82	8 309	317,714	75 040	392 754	396 063	
1882-83	4 928	216,212	35 320	251 541	256 469	
1883 84	2 501	175 852	59,675	235 557	238,058	
1884-85	723	247,886	62,853	310,739*	311,462	Seven maunds fodder removed by Government agency, value Re 1-2
1885 86	1,227	62 435	91 182	153,617	154 844	Half maund pipli seed, value Rs. 6.
1886-87	10,980	109 279	158,606	267 885	278 865	
1887-88	1,208	103,245	138,187	241 432	242 730	
1888-89	346	155,042	99,645	254,687	255,033	
1889 90	2,445	143,340	189,178	332,527	334,972	{ 1,552 maunds fodder; value Rs 24 { No, 26 bamboos, „ Rs 26.
Total	32,148	1,790,215	990 671	2,780,886	2,813,034	
Average	3,215	179,021	99,067	278,088	281,303	
1890-91 ..	1,052	158,300	249,830	408,130	409,182	

* Includes 101,238 cubic feet of dry and fallen wood exported by government agency, but omitted from the outturn in the Annual Report for 1884-85, paragraph 113.

The quantity of timber exported by government agency is insignificant, very little being taken out for sale; whilst that of fuel has varied spasmodically. This is apparently due to the unsettled policy regarding the supply of fuel to Darjeeling, and to interference with the operation of the laws of supply and demand, in that the price of produce has been fixed arbitrarily by the Department, instead of the *quantity* being determined and the price left to the free course of the market.

* Note.—This chapter was written before it was decided that the Singalilà Forest should be entirely omitted from this report

II.—Outturn removed

From the forests specially treated

Year.	Trees sold on permit.																	
	Walnut, tún, and pipli.		Champ.		Búk, phalát, katus.		Kawla and other laurels.		Maples.		Chilauni.		Gobria.		Other kinds.		Total.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.
		Rs.		Rs.		Rs.		Rs.		Rs.		Rs.		Rs.		Rs.		Rs.
1880-81 ..	T., 6	150	56	1,400	B., 117 P., 4 K., 84	1,755 60 1,260	98	980	15	150	33	330	46	460	8	80	467	6,635
1881-82	T., 1 P., 4	25 60	103	2,575	B., 135 K., 65	2,025 975	203	2,030	53	530	49	490	7	70	7	70	627	8,830
1882-83 ...	T., 6 P., 12	195 195	141	3,660	B., 197 K., 103	3,075 1,615	139	1,400	20	200	30	305	3	40	9	67	669	10,842
1883-84 ..	W., 1 T., 3 P., 1	40 120 30	104	3,120	B., 123 K., 40	2,460 800	79	1,110	12	180	16	240	14	210	5	50	393	8,360
1884-85 ..	T., 2 P., 2	80 60	206	6,180	B., 181	3,620	48	720	4	60	27	405	23	345	91	1,520	584	12,990
1885-86 ...	...	...	41	1,230	B., 39 P., 1 K., 18	780 20 360	48	693	1	15	7	108	10	150	5	45	170	3,407
1886-87 .	P., 1	68	25	870	B., 58 K., 6	1,302 138	51	770	2	33	15	240	...	...	9	113	167	3,594
1887-88 ..	...	...	60	2,160	B., 114 K., 4	2,850 105	72	1,112	2	33	12	196	4	61	2	22	270	6,549
1888-89 ..	T., 3	144	90	3,318	B., 110 K., 33 P., 30	3,332 833 712	93	1,556	8	131	14	230	14	351	6	70	401	10,697
1889-90 ..	...	...	129	5,292	B., 40 P., 19 K., 38	1,973 474 1,066	83	1,595	5	107	11	200	6	183	15	228	352	11,120
Total ..	43	1,167	955	29,814	1,565	31,639	914	11,966	131	1,529	214	2,764	127	1,890	157	2,265	4,105	93,034
Average yearly	4	117	96	2,981	157	3,164	91	1,197	13	153	21	276	13	189	16	227	411	8,304
Average price Rs	27·8		31·2		20·2		13 1		11 6		12 9		14·9		14 4		...	20 2
Per cent. of No	1·0		23 3		38 1		22·3		3 2		5 2		3·1		3·8		100	...
Per cent. of value ...	1·4		35 0		38·1		14·4		1 9		3 3		2 3		2 7		...	100

	Fuel.			Total Fuel.		Total Timber and Fuel	
	Firewood.	Charcoal.	Dry sticks.	Total cubic feet (estimated).	Value (Revenue 115).	Cubic feet.	Value.
	C. ft.	C. ft.	C. ft.		Rs.		Rs.
1880-81 ...	10,500	51,800	...	62,300	1,088	181,743	8,251
1881-82 ..	84 630	77,980	..	162,610	3,991	320,943	12,154
1882-83 ..	144,028	132,083		276,111	8,656	456,241	22,503
1883-84 ..	134,923	52,514		187,437	7,646	296,058	18,458
1884-85 ..	161,430	98,966	315	260,711	9,948	418,574	25,913
1885-86 ..	213,059	86,471	13,028	312,558	11,775	371,693	17,450
1886-87 ...	209,408	97,041	735	307,184	11,733	366,797	17,618
1887-88 ...	156,413	176,099	17,549	350,061	13,249	433,006	21,891
1888-89 ..	210,749	12,019	32,261	255,029	10,093	384,153	24,447
1889-90 ..	241,836	...	50,203	292,039	10,098	428,632	27,234
Total .	1,566,967	784,973	114,091	2,466,031	89,077	3,657,840	196,219
Average ...	156,697	78,497	11,409	246,603	8,908	365,784	19,622
Average price per 100 c.ft. Rs.	.	...	...	...	3·6	...	5·4
Per cent. of outturn ...	63 5	31·9	4 6	67·4	...	100	100
Per cent. of revenue ..			...	...	45 4	100	100
	100						

BY PURCHASERS.

in the Working-Plans Report.

Estimated volume of trees, cubic feet.	Dry and fallen Timber.		Poles.			Total timber.		Remarks.
	Cubic feet.	Value.	No.	Cubic feet.	Value.	Cubic feet.	Value (Revenue IIa).	
		Rs.		Rs.			Rs.	
116,760	2,693	538	...	...	...	119,443	7,163	
156,750	1,583	313	...	...	...	158,333	9,163	
167,250	12,868	2,800	4	12	2	180,130	13,644	Trees ... ... 86·1 77·5
99,300	9,121	2,452	...	...	...	108,621	10,812	Logs ... ... 12·4 21·2
146,000	11,863	2,275	...	...	...	157,863	15,265	Poles ... ... 1·5
42,500	16,635	2,268	...	...	...	59,135	5,675	Price of poles ... ... Rs. 17 per % ...
41,750	17,788	2,290	3	75	1	59,613	5,885	
67,250	15,575	2,807	12	120	6	82,945	8,642	
100,250	23,913	3,537	497	4,970	120	129,133	14,354	
88,000	35,633	5,237	1,290	12,900	179	136,503	16,536	

	Walnut.		Tun.		Pipli.		Bun.		Phalat.		Katus.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.
		Rs.		Rs.		Rs.		Rs.		Rs.		Rs.
1,026,000	1	40	21	714	20	413	1,120	23,219	54	1,266	391	7,155
102,600	0 1	4	2	71	2	41	112	2,322	5	127	39	716
Per %, 8·1 C.ft.	40·0	...	34·0	...	20 7	...	20 7	...	23 4	...	18·3	...
86·1	0·1	...	0·5	...	0·5	...	27·2	...	1·3	...	9 5	...
77·5	...	...	0·9	...	0·5	...	27·9	...	1 5	..	8·6	..

Ramboos.		Grazing and Fodder.					Total (Revenue IId).	Minor (produce IIe).	Remarks. Grand total (Revenue II).
Total No.	Value (Revenue IIe).	1 month—head cattle.	Compensation—Number of head of cattle.	Revenue from grazing.	Fodder.				
					Quantity.	Value.			
	Rs.		Rs.	Rs.	Mds.	Rs.	Rs.		Rs.
18,350	94	3,146	...	2,582	28,200	470	3,052	80	11,477
19,800	99	4,196	...	2,099	17,040	284	2,383	227	15,963
13,706	69	4,833	...	2,533	29,460	491	3,024	103	25,689
164,100	145	3,849	...	2,071	33,165	553	2,623	88	21,313
59,380	58	3,489	...	1,811	41,781	696	2,507	90	27,868
2,150	15	3,531	...	1,810	49,920	832	2,642	112	20,230
4,470	31	3,588	...	1,704	66,459	1,094	2,888	176	20,713
300	3	3,833	(88) (Rs. 102)	2,028	66,977	1,135	3,163	389	25,446
2,420	13	4,204	(176) (Rs. 214)	2,320	61,540	1,050	3,370	194	28,024
9,604	42	4,233	(328) (Rs. 453)	2,569	91,951	1,903	4,172	146	31,594
294,340	562	40,904	(592) (Rs. 769)	21,617	486,403	8,207	29,824	1,605	228,207
29,434	50	4,090	(59) (Rs. 77)	2,162	48,640	821	2,982	161	22,821
						Rs.			
...	...	...	...	...	Per % maunds	1·7	...	...	...
...	...	...	...	...	...	...	...	...	...
...	...	...	...	72·5	...	27·5	100	...	...

157. With reference to statement II, the relative importance of the revenue under each budget sub-head of II, calculated on the total revenue of the ten years, was as follows:—

Outturn removed by purchasers.

IIa.	IIb.	IIc.	IId.	IIe.	Total.
47	39	0·3	13	0·7	100

Considering only timber and fuel, we have—

	IIa. Timber.	IIb. Fuel.
Per cent. of outturn ...	32·6	67·4=100
„ of revenue ...	54·6	45·4=100

Timber

IIa. *Timber removed by purchasers.*—The sales of green trees, dry and fallen timber and poles compare as under:—

	Percentage. Quantity.	Value.
Trees ...	86·1	77 5
Logs ...	12·4	22 2
Poles ...	1 5	·3
	100	100

This shows that the sale of dry and fallen timber (logs) has been about twice as profitable as the sale of green trees. The price per hundred cubic feet estimated is:—

	Rs.	Rs	A P.
Trees ...	8	say 4 per ton, or about	1 3 per cubic foot.
Logs ...	16	8 „ „	2 6 „
		A. P.	
Poles ...	1·7	13 6 „ „	0 3 „

Though the factor (10 cubic feet per pole) adopted in the annual returns is perhaps rather high for the small poles ordinarily sold, yet the number of poles sold is trifling. The cubic contents of dry logs represent actual sale measurement, and, as shown in paragraph 93, the trees removed by purchasers are of large size, so that their estimated volume is well within the mark, and the calculations may therefore be accepted as on the whole reliable.

Sale of green trees.

The average price realised on 4,105 trees sold during the years 1880 to 1890 was Rs. 20 2 each. The highest of the various groups being champ, Rs 31·2 each, and the lowest, maples Rs. 11·6 each. The price for oaks and chestnuts taken together is exactly the average, viz., Rs. 20 2. Considering the more valuable species separately and the auxiliary species in groups, we find that the result of sales during the ten years was as follows:—

Species or group.	Trees sold. No.	Trees sold. Per cent.	Average price.
			Rs.
Walnut	1	0·1	40·0
Tún	21	0·5	34·0
Champ	955	23·3	31·2
Phalát	54	1·3	23 4
Búk	1,120	27·2	20·7
Pipli	20	0·5	20 7
Katus	391	9·5	18 3
Gobria	127	3·1	14·9
Miscellaneous	157	3 8	14·4
Kawla, etc	914	22 3	13·1
Chilauni	214	5·2	12·9
Maples	131	3·2	11·6
Total ...	4,105	100	Average 20·2

158. It has been the practice to sell trees at a fixed price apiece. The rates were raised 50 to 100 per cent. on the 1st January 1883, whereupon the number of trees sold fell from 669 to 398, and the revenue from Rs. 10,842 to Rs. 8,360. The next year, however, 584 trees were sold, the value being nearly Rs. 13,000. From the 1st November 1885 an additional ten per cent. was charged for every foot or part of a foot in girth over 8 feet. The sales dropped to 170 and 167 trees in the next two years, but quickly recovered. In October 1888 the extra charge was made applicable to trees over 7 feet instead of 8 feet in girth. The number of trees sold then declined from 401 to 352, which is about 60 below the average number sold yearly during the ten years.

Mode of selling trees.

The object was to husband the stock of flourishing trees for the regeneration of the forest. Concurrently, therefore, with the enhancement of the price of green trees the rates for dry and fallen wood have been progressively reduced until they now range from 6 pie to 4 annas per cubic foot; the higher rate being charged for walnut, tún and pipli, whilst a cubic foot of champ, búk and phalát costs 3 annas, and of chestnut 2 annas. The timbers chiefly in demand for tea box planking cost 1 anna 6 pie per cubic foot for dry-wood.

Sale of dry and fallen timber.

The sales of dry and fallen timber have steadily increased since 1883-84, thus:—

	C.ft	Value. Rs.
1883-84 ...	9,121	2,452
1890-91 ..	44,443	6,106

159. The sales of dead and fallen wood are necessarily limited by the quantity available; and, moreover, it is not sufficient to husband the stock of flourishing trees; it is also essential to dispose of the deteriorating stock which cumbers the ground and impedes the growth of younger trees. To effect this it is essential to discontinue the practice of allowing purchasers the pick of the best trees at a fixed price per tree, and to sell by measurement at reasonably low rates the serviceable portion of the defective trees. Accordingly, a revised schedule of rates has been drawn up in consultation with the Divisional Officer, and this has been sanctioned by the Conservator and brought into force with effect from the 1st October 1891 (See Appendix VI and paragraph 185.—"Rates paid by dealers to the Department.")

Measures recently taken to improve the system of selling timber.

160. The outturn of timber removed by purchasers during 1890-91 is shown in the following statement:—

Names of trees or groups.	Green trees. Girth, at 4 feet from ground, of trees sold. Feet. 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Total. No.	Total. Value.	Received on account of Extra girth.	Received on account of Compensation.	Total Revenue.	Estimated volume.	Dry and fallen timber. Sales. Quantity.	Sales. Value.	Compensation. Value.	Poles. Items.	Poles. Value.	Total timber.	Total revenue, Rs.
																		Rs.	Rs	Rs	Rs	C.ft.	C.ft.	Rs	Rs		Rs.	C.ft.	Rs
Pipli ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	112	48				112	
Champ ..	..	7	4	17	18	22	16	14	8	6	4	2	3	1	..	1	123	5,379	87	11	5,477	30,750	7,202	1,800				37,952	
Búk and Phalat		3	9	11	6	8	6	4	1	4	1				..		53	2,298	30	..	2,328	13,250	4,337	1,084	11	Sales		17,587	
Katus		7	5	8	12	8	11	9	4	1	3	3	..	1			72	2,048	60	50	2,158	18,000	8,003	1,001	3	No.		26,003	
Kawla and other laurels.	2	1	3	4	2	2	1	1	..	..	..	..	..	..	..	..	16	281	13	25	319	4,000	15,745	1,398	2	1,079	106	19,745	
Maples .. .	1	1	1	1	..	..	..	..	..	..	..	..	..	..	..	..	4	55	..	3	58	1,000	2,689	252	...	Compensation 35.	52	3,689	
Chilauni .				2		2				1	1		..	..	..	..	6	133	...	...	133	1,500	2,739	257	...			4,239	
Gobria ...																			...				1,149	108				1,149	
Other kinds ..					.					1	3	1		1	..		6	165		35	220	1,500	2,467	164	8			3,997	
																										Add Poles		11,140	
Total	3	16	16	41	48	40	36	30	16	9	13	9	4	1	2	1	280	10,379	190	124	10,693	70,000	44,443	6,106	24	1,114	158	125,583	17,038
Singaiila																													
Champ		..	.	1	..	2	1								.	..	4	110	...	...	110	1,000	345	40	...	...	...	1,345	
Katus .. .		..	.	.	.	.									.	.	.	...	.	...	...	.	27	3		..	.	27	
Kawla		...	..	..	..										.	.	.	..	.	..	..		81	5		..	..	81	
Grand Total	3	16	16	42	48	42	37	30	16	9	13	9	4	1	2	1	284	10,489	190	124	10,803	71,000	44,896	6,163	24	1,114	158	127,036	17,148

161. *IIb. Firewood and charcoal.*—The comparison between II*a* and II*b* has been made in paragraph 157. Two-thirds of the joint outturn is fuel, and the value of this is 45 per cent. of the combined revenue.

Fuel removed by purchasers.

Considering the condition of the growing stock in these forests, there can be no doubt that it is most important to find a market for the fuel. It ought to be cheap, and measures should be taken to reduce cost of extraction by providing convenient export roads and paths.

The sale of manufactured charcoal was stopped in 1888, on account of the wasteful manner in which the manufacture was carried on by purchasers, who paid the royalty only on the quantity of charcoal they removed and employed irresponsible contractors to make the charcoal. The purchasers now pay for the *wood* which is measured before the kilns are covered in. The risk of a kiln burning out, and the loss due to waste and careless manufacture thus, very properly, fall on the purchaser who makes the charcoal.

The outturn of firewood and charcoal-wood together, removed by purchasers, increased from 62,000 cubic feet in 1880 81 to 242,000 in 1889-90, *i.e.*, quadruple; and in 1890-91 amounted to 261,000 cubic feet nearly. The revenue under II*b* (Fuel) increased tenfold during the ten years, viz., from Rs. 1,088 to Rs. 10,698.

The sale of dry sticks increased from 315 cubic feet in 1884-85 to 50,200 cubic feet in 1889-90, and in 1890-91 amounted to over 77,000 cubic feet, being nearly 30 per cent. of the fuel removed by purchasers; whereas the quantity of dry sticks sold during the ten years 1880 to 1890 amounted only to 5 per cent. of the same. The importance of this item is great in other respects; for whilst the forests are cleared of decaying wood, cheap fuel is placed within the reach of the poorest, many of whom now make a livelihood by taking out dry sticks for sale. Tea-planters are also thus enabled to obtain cheap fuel for their coolies.

The average price realized for firewood during the ten years was Rs. 3·6 per hundred cubic feet of fuel removed by purchasers, say Rs. 6-5 per hundred maunds, dry sticks included—a price which compares favourably with Rs. 8 per hundred cubic feet realized for the finest timber trees. The average price per hundred cubic feet, taking timber and fuel together, was Rs. 5·4, or about ten pies per cubic foot.

162. *IIc. Bamboos.*—These are of small kinds only, and are now principally sold from the Singalilà forests. They were formerly used more extensively for making mats than they now are. Mr. Gamble, in his article on the Darjeeling forests, dated October 1875, wrote as follows:—

Bamboos.

"This little 'máling' bamboo is very valuable, as not only is it almost exclusively given as food for ponies in Darjeeling, but its stems split up are made into the mats with which all native houses in the hills are roofed. The chief place where these are made is at Sukia Pokri in the Goompahar forest, and the permit for the right of working up these bamboos produces a keen competition at the yearly auction." Iron roofs have, in Darjeeling at least, to a great extent taken the place of mat roofs, and the sale of bamboos fell off after 1883-84. A reduction in the price made in October 1888 immediately stimulated the demand. The number of bamboos sold from the Singalilà forests was doubled in 1889-90, and the revenue, which had fallen to Rs 300 in 1886-87, rose to Rs. 404 in 1889-90. The outturn of bamboos removed by purchasers during 1890-91, omitting Singalilà, was as follows:—

	No.	Value.
Bamboos sold	2,400	12
Compensation and outstanding ..	85	7
	2,485	19

163. *Grazing.*—Except in the Singalilà forests, monthly permits are issued. The number of cattle grazing for one month was lowest (3,489) in 1884-85, and has slightly but steadily increased to 4,233 in 1889-90, the average of the previous ten years being 4,090. In 1890-91 the number was 4,072.

Grazing and Fodder.

The intensity of grazing in the open portions of the forest specially treated in this report during the period (1882—91), in which it has been regulated has been calculated on the maximum number of cattle allowed to the registered graziers, and is thus shown :—

Forests east of Jorbungalow.		Forests west of Jorbungalow.	
Name of block.	Acres per head of cattle.	Name of block.	Acres per head of cattle.
Senchal	6·0	Nai	21·0
Tiger Hill	39 0	Balasan	18.0
Rungjo	19·3	Chongtong	37·4
Takdah	25·0	Parmaigiri	58·3
Chattakpur ...	20·0	Palongdong ...	22·7
Sonada *		Pagraingbong (part) ..	50·0
Pachim *			
Average ..	23½	Average ..	29

* Grazing ceased in the Sonada block after 1885-86 and in the Pachim block after 1883 84.

164. *Fodder.*—The demand for fodder has increased greatly. The rise has been steady, from about 17,000 maunds (value Rs. 284) in 1881-82 to about 92,000 maunds (value Rs. 1,603) in 1889-90. The average for the ten years is about 48,500 maunds, value Rs. 820. During 1890-91 the total outturn of fodder was 115,000 maunds, revenue Rs. 1,611 ; of which 17,160 maunds, and revenue Rs. 429 belong to Singalilà forest.

The price was unchanged throughout the whole period, viz., 8 annas per monthly ticket (estimated as 30 maunds). During 1890-91 a lower rate, viz., four annas per monthly ticket, was introduced for fodder other than máling bamboo, with the object of saving the latter as much as possible, the supply of which is necessarily diminished by grazing.

Minor produce.

165. The receipts under this head are trifling, Rs. 160 on an average during the ten years. In the forests specially dealt with cane, manjit (madder), seedlings, wax, honey, and chiretta are the principal items. Aconite is obtained from the Singalilà forests.

166. *III.—Outturn removed by free grantees.*

Year.	Timber.		Fuel.		Other produce.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	C. ft.	Rs.	C. ft.	Rs.	C. ft.	Rs.
1880-81 ...	...	...	...	...	...	...
1881-82 ...	...	...	...	...	...	...
1882-83 ...	...	...	...	...	...	...
1883-84 ...	...	...	...	...	...	...
1884-85 ...	...	...	...	.	...	...
1885-86 ...	.	...	...	...	...	...
1886-87 ...	...	...	437	12	...	...
1887-88 ...	2,930	360	...	...	No. Seedlings 100	50
1888-89 ...	1,500	135	...	...	Mds. Fodder 21	...
1889-90 ...	782	45	32	1	...	...
Total ...	5,212	540	469	13	...	50
1890-91 ...	950	24	...	...	Lds. Moss 151 / No. Seedlings 3,600 / C. ft. Stone 14,000	265

Thus the total value of free grants during the ten years 1880 to 1890 was Rs. 603 only, and during 1890-91 Rs. 289. The timber and stone were principally for the frontier bungalows and road, and the fuel for the jubilee bonfires. The seedlings were chiefly for planting in Darjeeling and in Birch Hill Park.

Outturn of the Singalilà forests.

167. The Singalilà forest was notified as a reserved forest with effect from the 10th October 1882. The following statement exhibits the outturn of the forest from 1882-83 to 1890-91, which was almost entirely removed by purchasers. The proportion of revenue under each budget sub-head of II was as follows:—

IIa.	IIb.	IIc.	IId.	IIe.	Total.
Per cent. ... 27	*Nil.*	25	43	5	100

SINGALILÀ.

Outturn removed by purchasers.

Year.	Trees sold on permit.								Estimated volume of trees.	Dry and fallen timber		Poles.		Total timber.	
	Champ.		Bûk, phâlat, and katus.		Kawla and other laurels.		Total.			Quantity.	Value.	Quantity.	Value.	Quantity.	Value (Revenue IIa.)
	No.	Value.	No.	Value.	No.	Value.	No.	Value.							
		Rs.		Rs.		Rs.		Rs.	C.ft.	C ft.	Rs.	No. C.ft.	Rs.	C.ft.	Rs.
1882-83	...		...	...	...			...	...		..			..	...
1883-84	.	...		..	...	.	...	...	.		...	...	..	.	..
1884-85		...	...	..	...	...			...		...	...	...		
1885-86	..		..	...	...	...				24	3	.. ...	...	24	3
1886-87	9	244	..	...	...	..	9	224	2,250	335	42	...	...	2,585	286
1887-88	33	898	B 3	56	..		36	954	9,000	276	34	1 10	4	9,286	992
1888-89	39	982	B. 10 K 5	220 110	3	41	57	1,353	14,250	80	10	1 10	12	14,340	1,375
1889-90	11	316	K. 8	186	...	...	19	514*	4,750	..	...	...	...	4,750	514
1890-91	4	110	...	..	...	...	4	110	1,000	453	57	.. ...	...	1,453	167
Total	96	2,550	B. 13 K. 13	572	3	41	125	3,175*	31,250	1,168	146	2 20	16	32,438	3,337
Average (5 yrs.)	19	510	5	114	1	8	25	635	6,250	234	29	4	3	6,488	667
Average price		26·6		22 0		13·7		25·3	Per °/o c. ft. 10 1	Per °/o c. ft. 12·5		Nominal.		Per °/o c. ft. 10·3	
Per cent. of No. ...		77		21		2	=100	...	...	..		...		.	=100
Per cent. of value ...		80		19		1	=100	95	...	4½		½			27

Year.	Fuel.	Bamboos.		Grazing and fodder.						Minor produce.			Grand Total Revenue II.
		No.	Value.	Cows and bullocks	Sheep.	Buffaloes.	Compensation head of cattle.	Total.	Value.	Wax and honey.	Aconite.	Total.	
			Rs.					No.	Rs.	Rs.	Rs.	Rs.	
1882-83	..	147,800	257	88	1,628	51	(20)	1,787	190			...	447
1883-84		243,600	406	100	1,625	51		1,776	307	114	25	139	852
1884-85	.	295,800	493	112	975	76		1,163	260	..	30	30	783
1885-86		171,000	285	225	708	57		1,050	288	70	.	70	643
1886-87	.	162,000	270	234	774	55		1,063	284		30	30	870
1887-88	..	181,200	302	242	757	68	...	1,067	278	35		35	1,007
1888-89	.	225,000	256	644	1,031	50	(351)	2,676	822	91	(Plants &c. 37)	128	2,581
1889-90	...	406,020	361	858	2,053	35	(306)	3,252	1,252	...	40	40	2,177
1890-91		523,800	418	753	1,714 Sale of fodder .. Mds. Compensation for ditto and lopping.	42	(153) 17,160 ...	2,662	1,088 286 143	38	50	88	2,190
Total	...	2,416,220	3,048	3,256	11,925	485 Fodder Mds.	(330) 17,160	16,496	5,208	348	175 Plants &c. 37	560	12,153
Average (9 yrs.)	Yrs Average (9)	268,500	339	362	1,325	54	(92)	1,833	579	39	23	62	1,350
Average price	...	Per thousand 1·2.											...
Per cent. of No.	...	..											
Per cent of value ...	...	25							43			5	=100

* Includes Rs. 12 received as compensation.

Outturn removed by Government Agency.

Nil.

Outturn removed by Free Grantees.

	No.	C.ft.	Nominal value. Rs.
Poles	95	950	24
Stone		14,000	70

Timber —Green trees have been sold since 1886-87 only. The sales reached a maximum of 57 trees, value Rs. 1,353, in 1888-89, but declined to four trees, value Rs. 110, in 1890-91.

Singalilà Forest.

The demand for dry and fallen timber has been unsteady. The maximum, 453 cubic feet, value Rs. 57, occurred in 1890-91.

There is practically no sale for poles from this forest at present. The revenue was received on account of compensation.

Fuel.—None has yet been sold.

Bamboos.—There is a constant demand which has increased since the price was lowered. The number sold during 1890-91 was nearly double the average of the nine years which have elapsed since the forest was acquired; and the corresponding revenue was the second best on record. On an average one quarter of the revenue is derived from the sale of bamboos.

Grazing and fodder.—Fodder was sold only in 1890-91 to the Commissariat Department, to the value of Rs. 286. Grazing is on the increase, especially during the past three years. Nearly half the total revenue is derived from grazing.

Minor produce.—Yields, on an average, a yearly revenue of Rs 62, about five per cent. of the total receipts, chiefly derived from wax, honey, and aconite. The demand seems to be intermittent.

The total revenue under II, for the nine years 1882—91, amounts to Rs. 12,153; average Rs. 1,350. The price paid for the forest was Rs. 21,222.

The outturn hitherto has been a mere nothing, and there can be no doubt that if the forest were more easily accessible, the demand would be much greater.

168. The foregoing particulars are given only for the two large tracts of forest which until lately constituted the Darjeeling Division, namely, that with which we are primarily concerned, and the Singalilà forest. Regarding the former, however, it is necessary to go into further detail in order to show (as far as information is available) the nature and extent of the demand made upon different parts of the forest, and to justify the formation of separate working-circles. With this object separate statements have been prepared for each group of blocks, which it is proposed to form into a distinct working-circle. These statements will be found in Appendix V. They show the outturn of the past five years, 1886-87 to 1890-91, for each of the blocks into which the forest has hitherto been divided, according to the agency of exploitation and the description of produce removed. Further reference is made to these statements in discussing the markets and other means of disposing of the produce (Chapter XIII).

The demand on different parts of the forests.

CHAPTER XII.

EXTRACTION OF THE PRODUCE.

169. This branch of forest management is here in a very backward state. Notwithstanding the injunctions strongly expressed in the working plan of 1880-90, no system has been followed for the opening up of the reserved forests.

Insufficient progress in the construction of export roads.

170. As a rule purchasers have been left to get out their produce as best they could, the improvement of export roads being undertaken only to facilitate departmental operations. Thus the Goompahar cart road (length barely 10 miles), which is the only one constructed during the last ten years, and that chiefly by the Public Works Department, was undertaken in order to allow of the firewood removed by government agency being more easily brought to depôt, and to prevent rates being raised in consequence of difficulty of transport. (See Annual Report for 1880-81, paragraph 57).

171. In the tract with which we are concerned rivers are not used for the transport of produce. The forests being of small extent and situated on the tops of the hills, the streams within their limits have a rapid fall and are full of boulders. Most of them have this character for many miles beyond the forest boundary.

Rivers.

172. The Darjeeling-Himalayan Railway is laid along the cart road from the foot of the hills to Darjeeling. The extension of this road from Darjeeling to Lebong (a site selected for new barracks), is in progress, and it is possible that the railway line may

Roads.

be extended to Lebong, but this has not yet been decided. As noted in paragraph 7, the hill cart road borders the forest for the greater part of the distance up from the south-west corner of Mahaldaram forest to Jorbungalow. Most of the adjoining forest is above the road, whilst the Dooteria and Goom blocks lie immediately below it. The road rises steadily, with a gradient of about 1 in 28 to 1 in 30, up to Jorbungalow; there is then a more gentle rise for a short distance as far as Goom Railway Station, whence the road descends with a rather steep gradient to Darjeeling. There is no necessity to send forest produce down the line, the chief markets served by the railway being Darjeeling and Jalapahar—at any rate for the blocks of forest above Sonada. Thus the gradient up to Goom station is against the load, and the rates of freight on the Darjeeling-Himalayan Railway are so heavy that it pays better to use carts, whereby transhipment is avoided. (*See* pages 78, 79, and paragraph 188.)

173. The Goompahar cart-road has already been described in paragraph 135.

174. The Jorbungalow-Pashok road (17 miles), which is the principal trade route between Darjeeling, Kalimpong, Sikkim and Thibet, passes through or along the boundary of the Senchal and Takdah forests for the first ten miles out from Jorbungalow. Only the first three miles, however, have a good gradient and are used for cart traffic, which is attended with considerable inconvenience and risk, as the road is so narrow that in many places there is barely room even for a pedestrian to pass the carts. The road, moreover, is not properly soled and metalled, the consequence being that it is soon cut up by the cart traffic during wet weather. The Public Works Department has charge of the road, and it is kept in tolerable repair. The necessity of widening the first three miles has been repeatedly urged by the Forest Department, and a project for this work, lately submitted by the Executive Engineer, has been strongly recommended by the Deputy Commissioner. This work is all the more needed because the west slopes of the Senchal range have already been denuded of serviceable timber. (*See* paragraphs 97 and 187.) The work has already been pegged out, and it is hoped that Government will sanction the widening, which is of the utmost importance, to facilitate the export of timber and fuel to Darjeeling and Jalapahar, as well as to improve the conditions of traffic generally on this the most frequented part of the road. All the produce from the blocks of forest north and east of Senchal (area about 12 square miles) must pass over this part of the road to reach Darjeeling or Jalapahar, and as these forests are for the most part of higher elevation than Jorbungalow, the traction will be on a downward grade almost the whole way into Darjeeling. It is necessary that the road should be widened sufficiently to allow two carts to pass. In the event of the new barracks at Lebong being built, about 50,000 cubic feet of timber will be required for their construction, and it is expected that half of this will have to be brought over the three miles of road in question.

175. The other roads are not suited for cart traffic, though some of them have been carefully aligned with easy gradients, so that they may eventually be converted into cart roads. On the 8-inch map submitted with this report, the roads and paths have been shown by conventional signs indicating the class to which they belong. A list of those made during the ten years 1880 to 1890 has been given in paragraph 135.

Buildings, and their adequacy.

176. A complete list of buildings (excepting forest guards' huts and those of a purely temporary character) has been given in paragraph 136. Excepting depôt buildings there are no structures especially used for the extraction of produce. As regards the adequacy of existing buildings, it must be pointed out that for the supervision of work under the provisions of this plan, they are not sufficiently numerous. Work will go on in seven working-circles, and in two places in each, and it is very necessary that the officer should have accommodation close to his work. It is almost impossible to make much use of tents in these forests on account of the damp climate, and also because it is difficult to find spaces suitable for pitching even the smallest hill tents. Moreover, work goes on in the forest all through the year, and the controlling and executive officers must have bungalows for use during the rains. These should be roofed with corrugated iron and in most cases have accommodation for two officers, the Conservator and the Divisional Officer for example. A point which requires attention, and has

been insufficiently attended to of late years, is the provision of adequate stabling and servants' accommodation at the rest-houses. The Divisional Officer will have to be pretty constantly on tour, and must often spend a week or ten days in one place, so that makeshift quarters are not suitable. The Divisional Officer's charge ranges from 600 feet in the Tista Valley up to 12,000 feet in the Singalilà forest, and his servants suffer considerably from changes of climate and frequently get ill. Comfortable quarters are, therefore, necessary in order to diminish the chances of interruption of work, as well as being conducive to the personal well-being of the forest officer and his followers.

CHAPTER XIII.

MARKETS AND OTHER MEANS OF DISPOSING OF THE PRODUCE.

Forest products exported.

177. The information required in this important chapter has been very difficult to obtain.

With the exception of a few articles of minor produce exported from the district, the markets are local. The minor products exported from the hill forests are chiefly:—

Aconite. (Aconitum ferox, *Wall.*) obtained from the higher parts of the Singalilà forest, from the estate of Cheboo Lama, and from Sikkim and Nepal; quantity exported about 300 to 500 maunds, said to be purchased by marwaries at Pulbazar and elsewhere at Rs. 2 to Rs. 5 per maund, and exported to Calcutta (Armenian Ghât). Aconite has recently been added to the goods tariff of the Darjeeling-Himalayan Railway.

Wax and honey obtained from the same sources, as well as from the estate of Rajah Tenduk Pulger (Gôke Spur). The honey is sold locally at annas 4 to annas 8 per bottle; the wax is purchased by marwaries at about Rs. 34 to Rs. 37 a maund and exported to Calcutta.

Chiretta.—(Swertia Chirata, *Ham.* and other species) obtained at higher elevations on Cheboo Lama's estate and from Nepal. Little comes from the reserved forests. Local price about Rs. 2 to Rs. 3 per maund. Exported to Calcutta, about 150 maunds yearly.

Manjit (Rubia cordifolia, *Linn.*).—In 1888 fully 1,000 maunds were exported, but since then the market has been dull, and none has been taken. The price paid by marwaries to the collectors was about Rs. 2 to Rs 3 per maund.

178. Before discussing the various local markets, it will be advisable to give an account of the population of the country.

Population in and around the forests.

According to the Deputy Commissioner's preliminary census report for 1891, the population in the sudder charge, *i.e.*, the thannahs of Darjeeling and Jorbungalow less Kalimpong, is given as follows:—

Different heads.	Occupied houses.	Persons.			Remarks.
		Males.	Females.	Total.	
Darjeeling Municipality ...	2,727	8,063	5,073	13,136	* The only permanently-settled estate in the district.
Jalapahar Cantonments ...	230	925	244	1,169	
Forests	553	2,259	1,147	3,406	
Tea estates	9,654	21,471	21,663	43,134	† Almost solely the Government Cinchona Plantation.
Khás mehals ...	1,244	3,620	3,353	6,973	
Cheboo Lama's grant* ...	1,517	4,241	3,938	8,179	
Other estates† ...	541	1,518	1,299	2,817	
Total ...	16,466	42,097	36,717	78,814	

179. The above fairly represents the tract in which the Darjeeling forests lie. The main results of the census for the entire district according to different heads are thus tabulated by the Deputy Commissioner:—

Different heads.	Area in square miles.	Occupied houses.	Persons.			Number of persons per square mile	Number of houses per square mile	Number of persons per occupied house.
			Males.	Females	Total.			
Forests ..	439	752	3,805	1,586	5,391	12 2	1 7	7 1
Tea estates .	242	20,256	47,135	42 449	89 584	370 1	83 7	4 4
Khás mehals	333	17,496	48,500	41,033	89,533	268 8	52 5	5 1
Chebob Lama's grant .	40	1,517	4,241	3,938	8,179	166 9	30 9	5 3
Darjeeling Municipality	5	2,727	8,063	5,073	13,136	2,627 2	545 4	4 8
Kurseong ditto	2	715	2,234	1 399	3,633	1,816 5	357'5	5 08

If the government forest reserves are excluded, the density of the population is on the average 300 souls to the square mile.

As regards Darjeeling Municipality, it must be borne in mind that on the 26th of February, when the census was taken, the population was at the minimum.

The principal local markets.

180. The chief local markets for the produce of the forests are:—

(*i*) Darjeeling.
(*ii*) Jalapahar.
(*iii*) Tea-plantations.

The demand is greatest in Darjeeling during the spring and summer, when the station is full of visitors, whereas the tea-planters lay in their supplies during the cold weather.

Some produce is also taken to Jorbungalow and Goom bazars, which are very close together on the cart road, and situated between the forests on the one hand and Jalapahar and Darjeeling on the other. Several dealers in timber and fuel reside in these bazars, which will be considered as forming part of the Darjeeling market. In other small bazars or hamlets, such as Sonada (where there is a brewery), and Rangbul on the Darjeeling-Himalayan Railway, both close to the forest, a certain amount of produce is consumed; whilst the outturn of the Mahaldaram forest goes for the most part towards Kurseong, but is not at present important.

The markets of Darjeeling and Jalapahar are circumscribed within more or less narrow limits, but each tea-concern constitutes a separate and independent market, and in many cases has a distinct line of export. The requirements of the Public Works Department and of the Darjeeling-Himalayan Railway, as far as they are met from the reserved forests, are supplied through contractors who purchase the produce on permit. Here, again, the material may be taken out of the forests at many different points, so that it is impracticable to set aside any particular blocks of forest to supply such requirements. The same contractors often have on hand at the same time contracts to supply other parties, whilst there are many petty dealers and private individuals who purchase direct from the Forest Department under the permit system. The destination of produce thus removed is not as a rule recorded, and only in a few cases can it be ascertained. The consequence is that the information required in this chapter cannot be given as concisely and as accurately as is desirable; but the following pages give the data that it has been found possible to collect on the subject.

The Darjeeling market.

181. *Distance of market from the forest*, 5 to 15 miles.

182. *Lines of export*.—The Hill cart road (Darjeeling-Himalyan Railway) for the west slopes of Mahaldaram and Senchal forests, and the Jorbungalow-Pashok and the Rangbi bridle roads for the north and east slopes. The Pashok road also for the Takdah forest. For the Goompahar forest the main export line is by the Goompahar cart road to Goompahar railway station, then the Hill cart road (Darjeeling Himalayan Railway).

For produce, such as fodder, carried by coolies, the usual line of export is *viâ* Jorbungalow and Jalapahar.

183. *Description and quantity of produce consumed*.—The most important descriptions of produce are sawn timber, firewood, charcoal and fodder. Bamboo mats are taken to Darjeeling for sale chiefly from the Singalilà

forest and from Nepal, but are not much used for roofing in the station. Minor produce is of little importance.

The quantity of produce consumed can only be roughly estimated. It may vary from year to year according to the magnitude of the special works undertaken, such as the building of a durbar hall, a large college, sanitarium, railway station, barracks or hotel. The construction of a road like that to Lebong requires timber for railings, although bridges are not needed owing to the smallness of the streams. The possible extension of the railway to Lebong may still further increase the demand for timber; whilst the addition to the population, which will ensue on the completion of the barracks, will necessarily augment the demand for fuel and fodder.

The following estimate is based on the current demand, as nearly as it can be gauged. It includes the probable demand of Jorbungalow and Goom bazars, as belonging to the sudder station and within municipal limits:—

Description of produce.		Estimated demand on—		
		Reserved forests	Other sources.	Total.
Timber	C. ft.	100,000	50,000	150,000
Fuel	„	400,000	80,000	480,000
Total ...	C. ft.	500,000	130,000	630,000
Fodder	Mds.	73,000*	40,000	113,000

*Note.—This is allowing 200 maunds a day. The number of horses and ponies registered by the municipality during the half-year ending September 1891 was 147, that is the half-year when Darjeeling is full of visitors. Animals exempted from tax may increase the number somewhat, but 200 maunds a day is a safe figure.

184. *Sources from which supply is drawn.*—Besides the reserved forests, other sources of supply, both within the district and in Sikkim, have undoubtedly been, and still are, drawn upon, whilst coal and a small quantity of timber reach Darjeeling by rail. The use of old packing cases in the construction of shops and dwellings of the poorer classes is a considerable saving to the forests.

The following are the chief extraneous sources of supply; but for details reference is invited to paragraph 203.

(*a*) Rilling or Liring forest, on the estate of Cheboo Lama, now owned by Rinchôk Dewan, and situated below the Singalilà forest to the north-west of the Little Rangit river.

(*b*) Gôke, part of the same estate, now owned by Rajah Tenduk Pulger, situated between the Rammam and Little Rangit rivers, north of Darjeeling.

(*c*) Municipal land, between Jorbungalow and Goompahar.

(*d*) Achay Lall's land, below Goompahar forest at the head of the Rangbong river.

(*e*) The Maharajah of Burdwan's land near Sonada, and a smaller piece north of Jorbungalow.

(*f*) Hopetown land at Sonada.

(*g*) Sikkim

(*h*) The railway.

No record is kept of the imports and exports of the town; but, as far as possible, information has been collected, for the present report, and will be found in paragraph 207.

185. *Rates paid by dealers to the department for produce.*—The rates are fixed from time to time by the Conservator of Forests on proposals submitted by the divisional officer. They are not specially applicable to the produce exported to the Darjeeling market, and the schedule at present in force is therefore given as an appendix (No. VI). It was drawn up in consultation with the writer of this report; the most important change being the substitution of a cubic foot rate instead of the fixed price per tree, except in the case

of trees at present little valued, but which occasionally grow to large size. The retention of the old rate for these may, it is hoped, tend to bring such timber into use. A reduction has been effected in the price of dry timber, poles and firewood, and a liberal addition made to the list of fodder plants for stall-feeding, after careful enquiry as to what plants which are valued as fodder may safely be included. Several articles of minor produce, for which a charge was formerly made, have been placed upon a free list.

Care has to be taken, in fixing rates departmentally, that they shall approximate as nearly as possible to the market rates. As a rule some change has been made in the rates every year, and in some instances without a just appreciation of the probable result. The mistaken notion seems to have prevailed that high prices were necessary to prevent the forests being overworked, or in order to make them pay. The price of fuel especially has been forced up in consequence of the unsatisfactory results of departmental fuel operations, when the remedy lay rather in increasing the quantity sold, to which end a *reduction* of rates would have rather conduced. Fuel, which abounds in these forests, has been carefully sold by measurement, and the system of sale by the 'cord' was also introduced to guard against loss. Timber of the best quality on the other hand, which has been frequently proclaimed to be getting scarcer and scarcer ever since the forests were reserved, has been sold, volume for volume, at about half the price of dry and fallen wood during the last ten years. When it is further considered that very little has been done to lessen the cost of removal of forest produce by purchasers, it is surprising that the demand upon the reserved forests should have increased so much as it has.

186. *Cost of cutting and delivery at Darjeeling.*—About Darjeeling there is often uncertainty regarding the rates of labour, which may be attributed to the recruiting of men for military purposes, the construction of large works, or to the sudden demand for labour to repair damage done to public communications by a landslip or a torrent during the rains.

The following rates are now in force in Darjeeling (1891):—

	Rs. A. P.
Mason, hillman	0 10 0 per day.
„ plainsman	0 10 0 to 0-12-0 per day.
Carpenter, hillman	0 8 0 per day.
„ plainsman	0 12 0 „ „
„ Chinaman	2 4 0 „ „
Coolie, day labourer	0 4 0 to 0-8-0 per day.
Sirdar's commission usually	0 0 6 per coolie.

The Public Works Department often pays a higher rate for labour where the work is arduous.

Rates for forest work also vary with the difficulty of the ground, the qualities of the wood, such as weight, hardness, the facility with which it can be cut or split, and so forth; the rates quoted in the following statement must therefore be regarded as merely approximate.

Cost of cutting and delivery of timber and fuel at Darjeeling.

Description of produce.	Approximate cost of Cutting and delivery at Darjeeling, average distance 10 Miles.											
	Cutting.			Carriage to cart road.			Carting.			Handling in depôt.	Total.	
	Rs. A. P.		Rs. A. P.	Rs. A. P.		Rs. A. P.	Rs. A. P.			Rs. A. P.	Rs. A. P.	Rs. A. P.
(a) Timber in scantling, per cubic foot ...	0 4 0	to	0 5 0	0 2 0	to	0 3 0	0 2 0			Nominal.	0 8 0	to 0 10 0
(b) Fuel ... Firewood, per cord ...	2 2 0		...	1 0 0	to	3 0 0	7 13 0			0 3 0	11 0 0	to 13 0 0
(b) Fuel ... Charcoal, per bag ...	Making. 0 4 0	to	0 5 0	0 1 6	to	0 3 0	0 2 6			...	0 9 0	to 0 10 6

In the case of firewood despatched from a reserve depôt there is a further charge of about 2 to 3 annas for handling. Loss by dryage, etc., and the cost of depôt buildings, stores, establishments, etc., are not here taken into account, but see paragraph 127 *et seq.*

187. *Cost of transport.*—This is a heavy item owing to the limited extent of carting roads, and the high rates for carriage both by road and rail. As a rule forest produce must first be carried to the cart road or railway by coolies,

and may then be carted or railed to Darjeeling. Very heavy pieces of timber are, of course, more expensive to transport than those of a manageable size, and it is always preferred to cut large beams and heavy scantlings in forests above the cart-road or railway, so that the timber may be slid; but the forests so situated (especially the west slopes of Senchal) have been cleared of first class timber by the early operations of the Department, and later to supply the Darjeeling-Himalayan Railway when under construction.

Carriage by coolies to a cart road has for the most part been up hill, as most of the blocks worked lie below the roads. Firewood is in such cases generally cut in the upper part of a block, *i.e.*, nearest the road, charcoal being made in the more remote part. Thus firewood has been carried on an average about 500 feet uphill and charcoal about 800 to 1,000 feet.

Since the construction of the railway, carts have become rather scarce; cattle disease also is not unfrequent. The usual hire of a bullock cart is about Re. 1 per day, and the reason why the rates for carting forest produce are higher, is explained by the fact that the carts must always return empty. The mileage rate now paid is Re. 1-9 per 100 maunds per mile, or 3 pies per maund per mile (or per bag per mile for charcoal which is more bulky). On account of extra handling, however, and the impossibility, in general, of making two trips a day even from the nearest forests, the cartmen do not care to cart for very short distances at the mileage rate, but prefer a contract rate. The cost of transport per 100 maunds of firewood by cart and by Darjeeling-Himalayan Railway may be compared thus:—

By rail ten miles into Darjeeling.

	Rs.	A.	P.
100 maunds loading into trucks	0	6	0
Railway freight @ Re. 1-4 per mile	12	8	0
Unloading at Darjeeling goods station and carrying to depôt @ 6 pies per maund	3	2	0
	16	0	0

If the last item were avoided by railing direct into the depôt, there would be an advantage of Rs. 2-12 per 100 maunds in favour of rail for a distance of ten miles.

By cart ten miles into Darjeeling.

	Rs.	A.	P.
Carting 100 maunds, 10 miles, @ Re. 1-9 to Darjeeling depôt, the loading and unloading of carts being done by cartmen ...	15	10	0

Partly by cart and partly by rail.

If firewood were carted, say, 6 miles to Goom Railway Station, and thence railed 4 miles to Darjeeling, the charges would be— carting 100 maunds, 6 miles, @ Re. 1-9	9	6	0
Loading into trucks	0	6	0
Rail from Goom to Darjeeling, 4 miles, @ 1-4	5	0	0
Carriage by coolies from goods station to depôt @ 6 pies per maund	3	2	0
	18	14	0

Even if the last item were avoided by railing direct into depôt, there would still be a balance of annas 2 per 100 maunds in favour of carting.

The following are the classified goods rates and conditions at present applicable to forest produce, and to coal and coke on the Darjeeling-Himalayan Railway:—

Upwards ...	1st class 3 pies per maund per mile 2nd „ 3½ „ „ „ „ „ 3rd „ 4 „ „ „ „ „ 4th „ 4½ „ „ „ „ „ 5th „ 5 „ „ „ „ „	Plus one anna per maund for handling charges.

Downwards 20 per cent. less than the upwards rates.

* *Special class rates on the Darjeeling-Himalayan Railway.*

Class.	Rate.	
	Rate per maund per mile.	Between Silliguri and Darjeeling.
		Rs. A. P.
A ...	1·41 pies.	0 6 0
B ..	1·5 „	0 6 4
C ...	1·88 „	0 8 0
D ...	2·35 „	0 10 0
E ...	2·58 „	0 11 0

* In cases where an upwards special rate is quoted for any commodity and not a downwards rate the classified rate for the article applies in downwards booking and *vice versa*.

Goods in bulk, such as coal, charcoal, earth, loose tea-shooks (*i.e.*, not in bundles) are to be loaded and unloaded by the owner, and if this work is done by the Railway staff, an extra charge is made for each time the goods are handled by them.

TARIFF.

TIMBER.

	Class.
Woods, valuable or ornamental, such as walnut, * * maple, * * &c., not exceeding 10 feet in length, and subject to a minimum of 164 maunds per wagon, at owner's risk	1
Timber, unwrought, including beams, railway sleepers, doors, chowkats, planks, rough sawn not planed or chiselled, subject to the limits and conditions for bulky goods	1

Over the Darjeeling-Himalayan Railway, in local booking only, rough sawn timber is carried at the rate of Re. 1-8 per 100 maunds per mile, subject to a minimum of 4 miles and 25 maunds. No beams over 33 feet long can be booked over this line.

Bulky articles.—Consignments of less weight than the carrying capacity of the truck, and which by reason of length, breadth, bulkiness or any other cause, may require to be loaded separately in a wagon or truck, or which may occupy two or more vehicles, are charged at not less than the capacity of the vehicle or vehicles used. Should the weight of a consignment tendered be below the minimum, senders may elect to pay the minimum charge, or let the consignment wait until the railway can make up a load, in which case actual weight is charged. Forty-eight hours' notice is required for six-wheeled vehiches and girder-trucks necessary for the carriage of heavy or long pieces of timber.

When timber is of such a length that it cannot be weighed,† it is charged on weight ascertained by measurement, thus—

Teak and other timber @ 20 seers per cubic foot.
Sâl @ 30 „ „ „ „

	Class.
Poles or bullies are carried as timber	1
Tea-shooks	1

FUEL—

Coal or coke in bags over the Darjeeling-Himalayan Railway	A

In order to encourage the tea industry and to give the district the benefit of cheap coal, the Darjeeling-Himalayan Railway Board of Directors has lately,

† NOTE.—This rate has been found to render the cost of carriage of long bamboos by rail quite prohibitive.

as an experimental measure, reduced the rate of freight for steam-coal one-third with effect from the 1st October 1891.

Experimental reduced rates for steam coal over the Darjeeling-Himalayan Railway.

	Rs.	A.	P.
From Siliguri to Kurseong	0	2	6
Toong	0	2	11
Sonada	0	3	4
Goom	0	3	9
Darjeeling	0	4	0

Firewood 1

In local booking only on the Darjeeling-Himalayan Railway, firewood is charged at Re. 1-4 per 100 maunds per mile, subject to a minimum charge of 4 miles and 500 maunds.

	Class.
Charcoal over Darjeeling-Himalayan Railway	A
Bamboos „ „ „ „ (see bulky articles) ...	C
FODDER—Fodder and forage for the Commissariat Department; grass and hay (upwards); and straw	D

MINOR PRODUCE—

	Class.
Aconite over the Darjeeling-Himalyan Railway	2
Chiretta „ „ „ „ „	3
Canes	2
Manjit or madder	Not quoted.
Wax, unrefined	1
Seeds (upwards)	E
Plants and shrubs at owner's risk	2
„ „ „ „ railway risk	4
Bark for tanning in bags or in bundles securely packed	2
„ „ „ „ loose	3
Roughly-cut stone at owner's risk (upwards)	C

188. The following quotations of rates have been supplied by the Acting General Manager, Darjeeling-Himalayan Railway, who states that no reduction is made for the articles quoted, on the "up" journey from Goom to Darjeeling, which is down hill :—

Articles.	Up between Kurseong and Darjeeling.	Down between Sonada and Kurseong.
Timber ...	Rs. A. P. 0 4 7 per maund or Rs. A. P. 28 8 0 per 100 maunds.	Rs. A. P. 0 2 5 per maund or Rs. A. P. 15 0 0 per 100 maunds.
Firewood ...	0 3 10 „ „ „ 23 12 0 „ 100 „	0 2 0 „ „ „ 12 8 0 „ 100 „
Charcoal ...	0 2 3 „ „ „	0 1 2 „ „ „ .....

The carriage of a maund of firewood from Kurseong to Darjeeling costs only 2 pies less than that of one maund of coal from Silliguri to Darjeeling, the distance being as two to five, whilst one maund of steam coal is probably equivalent to two maunds of wood as engine fuel. In order, therefore, that the two kinds of fuel might compete on equal terms as regards carriage on the Darjeeling-Himalayan Railway, the rate for firewood from Kurseong to Darjeeling ought to be 9·6 pies per maund, or one-fifth only of the rate (annas 3-10) above quoted. In other words, the rate for the carriage of firewood is Re. 1-4 per 100 maunds per mile, say 10 annas for one maund for the distance from Silliguri to Darjeeling, against 4 annas for a maund of coal. Thus, even for equal weights, the rates for carriage of firewood (of which the value is only half) is $2\frac{1}{2}$ times that of coal, a commodity of which the Darjeeling-Himalayan Railway has a monopoly in this district. In spite of this, however, the cost of firewood is only a trifle more than half that of an equivalent of coal.

The Jalapahar market. 189. *Distance of market from the forest*, 2 to 12 miles.

190. *Lines of export.*—As far as Jorbungalow and Goom the lines of export are the same as those to Darjeeling. The military cart-road from Jorbungalow to Jalapahar about $1\frac{1}{2}$ miles. Coolies carrying loads go by the bridle

road east of Jalapahar hill: distance from Jorebungalow to Commissariat godowns about 1 mile.

191. *Description and quantity of produce consumed.*—Few new buildings have been erected of late years; timber is chiefly required for repairs to existing buildings and railings along roads. The Engineer in charge of Military Works has kindly furnished the following estimate of the timber required annually, and the officer in Commissariat charge that of the annual consumption of fuel and fodder:—

Description of produce.	Estimated quantity derived from—		
	Government forests.	Other sources.	Total.
Timber ... Oak and chestnut ..	1,500	...	5,500
Timber ... Champ and other kinds ...	4,000	...	
Mds.			
Fuel ... Firewood (41,000)=C. ft. of wood...	72,000	...	90,000
Fuel ... Charcoal (2,000)= „ do. ...	18,000	...	
Total Timber and Fuel ... C. ft.	95,500	...	95,500
Fodder ... ... Maunds ...	42,000	...	42,000

In the event of the work at Lebong being undertaken during next year, it is roughly estimated that about 50,000 cubic feet of timber will be required within two years; half of the timber to be oak or sâl, and the other half champ.

192. *Sources from which supply is drawn.*—The produce is almost exclusively drawn from the government forests, which are the nearest to Jalapahar. The Commissariat Department is supplied by government agency, whilst shopkeepers in the small cantonment bazar, and a few residents buy fuel from the Forest Department depôt or from outside. The quantity of fodder consumed includes about 11,000 maunds in addition to that taken by the Commissariat Department.

193. *Cost of cutting and delivery at market*—

	Rs.	A.	P.
Timber per cubic foot about	0	10	0
Firewood (carted five miles) per 100 maunds	16	8	0
„ (carted six miles) „ „ „	18	0	0
Handling charges at Jalapahar on delivery	0	5	0
Charcoal (carted six miles) per bag or maund	0	8	0

194. *Cost of transport.*—Up to Jorbungalow or Goom Railway Station the conditions are the same as for Darjeeling, but from the latter point the gradient is down-hill to Darjeeling, and against the load to Jalapahar. The following particulars are given to show the relative cost of transport of firewood per 100 maunds, by different modes of conveyance, from the 3rd mile on the Pashok road to Jalapahar. The cost of carriage from the 'coupe' to the cart-road, which would be the same in each case, is omitted:—

	Rs.	A.	P.
a.—Carting the whole distance—			
100 maunds, carted 4½ miles, at Re. 1-9 per mile ...	7	0	6
b.—Carrying by coolies the whole distance—			
100 maunds carried (*vid* short cut) 4 miles, at Re. 0-2-0 per maund	12	8	0

For the export of produce from the forests on the west of the Senchal Range, abutting on the Darjeeling-Himalayan Railway, there would be very little advantage in using the railway even for the extreme distance, five miles, from Sonada to Jorbungalow, where the load would have to be transferred from trucks into carts. The saving would in this case be about 10 annas per hundred maunds, but the minimum distance of four miles charged by the railway would necessitate carts being used for any shorter lead.

Tea Plantations.

196. *Distance of market from the forest.*—As mentioned above, each tea-estate is virtually a separate market. It is out of the question to consider each one by itself, but the distance from the forest may be said to vary from 2 to 14 miles. Considering only those localities or groups of tea estates, where supplies are drawn from the reserved forests, it seems that they may be arranged in fairly distinct areas thus:—

Situation of groups of tea estates with regard to the forests most convenient for their supply.

Description of localities.	Designation of group.	Distance from nearest forest.
North of Goompahar Forest and between the little Rangit River and the Hospital Jhora. (This area is divided into two groups by the Chongtong spur)	West ...	2 to 14
	East ...	2 to 10
South of Goompahar Forest and west of Mahaldaram and Senchal Forests.—This area may be divided into three groups namely:—		
(i). Estates on the Nagri spur and in the Rangbong valley	Nagri spur	2 to 10
(ii). Estates in the upper part of the Balasan valley north of the Rangmuk jhora	Dooteria	2 to 10
(iii). Estates on the Hopetown spur, and as far south as Namsu market, at the junction of the Rangbong river and Chattakpur jhora with the Balasan river.	Southern	2 to 14
East of Senchal—This group comprises the tea estates below the forest on the Tungbu (Takdah) Rango	Takdah	2 to 6

197. *Lines of export.*—Each concern adopts the route most convenient to itself. The paths are for the most part steep hill-paths with many zigzags.

198. *Description and quantity of the produce consumed.*—The demand comprises timber for building and for tea boxes; firewood for engine-fuel and tea-drying machines; charcoal for drying tea in the old style, and for domestic use; bamboo and cane for baskets, trays and other utensils used in the industry.

Timber.—There is no information regarding timber consumed on tea-estates in past years, and it is probable that the greater part of it was grown on the estates; but for the construction of new buildings and the repair of old few concerns now have sufficient timber on their own property. A certain quantity is therefore probably taken from the reserved forests. In the replies received to a circular, in which managers of the surrounding tea estates were invited to state their requirements, building timber has only been entered in a few instances, as shown in the statements given in paragraph 199.

Timber for tea-boxes is a much more important item, and the demand increases yearly, on account of increased outturn of tea and the gradual exhaustion of private sources of supply within paying distance. From the particulars of probable requirements submitted by 18 tea concerns, large and small, it seems that the average quantity of box-planking consumed is 27,000 square feet of $\frac{1}{2}$ inch planking for each concern. This is about equivalent to 1,125 cubic feet of planking, or 1,400 cubic feet in the tree, allowing about 25 per cent. for waste in conversion. Most of the box-planking used by tea-estates, even within eight or ten miles of the reserved forests, is at present

probably derived from other sources, for the reasons explained in paragraph 201; but a considerable and increasing quantity is taken from the Government forests. The kinds of timber so taken are chiefly champ, kawla and other kinds, except búk, phalát and katús.

The average number of trees sold during 1880—90 was 411 per annum.

If we deduct all the búk, phalát and katús, two-thirds of the champ, and one quarter of the other trees sold, the balance of 140 trees probably represents very nearly the demand made upon the forests for tea-box timber. Taking the volume of timber in a tree as ranging between 100 and 200 cubic feet, say 150 cubic feet on an average, we have 21,000 cubic feet; to which may be added 2,000 cubic feet (roughly 10 per cent.) on account of planking obtained from dry wood, making a total of 23,000 cubic feet as the probable demand on the reserved forests. This would correspond to the requirements of about sixteen tea estates, and does not seem unreasonable.

Fuel.—This is at present a far more important item than timber, both in respect of the needs of the tea industry and the present condition of the forest crop. The subjoined statements have been made out to show the demand for fuel by tea estates during the ten years 1880-90, and separately for 1890-91, according to the working-circles proposed in Part II of this report. These statements have been compiled since paragraph 125 was written, and they comprise the entire forests of Gompahar, Senchal, Mahaldaram and Takdah; whereas in the paragraph quoted the blocks included by Dr. Schlich in the Darjeeling and Jalapahar circles only were considered. There has been a general increase in the demand and in the number of tea estates purchasing fuel from the forests (see for example the statement for Nagri Working-Circle). If the price of firewood is adjusted so as to compare favourably with that of coal, and steps are taken to diminish the cost of its transport to centres of the tea industry, there is every prospect that the demand for it will increase enormously in about five or six years' time. The statements given in paragraph 199 below show that a vast increase may be expected in the demand of those tea concerns alone which have dealings with the Forest Department at present.

Supply of Fuel to Planters from 1880 to 1891.

Goompahar Round (Tasiding Working-Circle).

Year.	Demand for fuel.		Remarks.					
	Firewood.	Charcoal.						
	Mds.	Mds.	Bishibat.	Mim.	Tumsong.	Chongtong.	Chongtong Association.	Sidarpong.
1880-81	1,000	...	1,000	...	...	...	...	...
1881-82	511	...	511	...	...	...	...	...
1882-83	...	...	...	...	...	...	...	...
1883-84	1,000	...	1,000	...	...	...	...	...
1884-85	1,975	...	1,975	...	...	...	...	...
1885-86	4,000	...	4,000	...	...	...	...	...
1886-87	6,000	...	1,000	2,000	3,000		...	...
1887-88	16,150	...	6,150	...	...	10,000	...	...
1888-89	4,100	...	4,100	...	...		...	...
1889-90	3,600	...	1,600	...	...	...	2,000	200
Total ...	38,536	...	21,336	2,000	3,000	10,000	2,000	200
Average ..	3,854	...	...	.	...	...	...	...
1890-91	5,050	...	3,000	..	...	500	...	1,550

Goompahar Round (Posambing Working-Circle).

Year.	Demand for fuel.		Remarks.					
	Firewood	Charcoal.						
1880-81	...	...	Lingia.	Tumsong.	Mim.			
1881-82	...	...	...	...	...			
1882-83	...	...	...	...	...			
1883-84	...	...	...	...	...			
1884-85	*3,500	†1,198	*3,500	†1,198	...			
1885-86	5,000	...	3,000	...	5,000			
1886-87	...	...						
1887-88	...	...						
1888-89	...	...						
1889-90	...	...						
Total ...	11,500	1,198						
Average ...	...	...						
1890-91	...	...						

Abstract.

Goompahar Round.

	Mds. of wood.	Equivalent in cubic feet.
Approximate present demand of the two working-circles together	5,500	10,000

Note.—These two working-circles were formerly reserved for the Darjeeling supply.

Supply of Fuel to Planters from 1880 to 1891.

Sukia Round. (*Mim Working-Circle.*)

Year.	Demand for Fuel.		Remarks.									
	Firewood.	Charcoal.										
	Mds.	Mds.	Mim.	Lingia.	Tungsong.	Marybong.	Chongtong Association.	Dooteria.	Mundakoti.	Tursum.	Chongtong T. E.	F=Firewood. C=Charcoal.
1880-81	...	...	...	...	...	...	...	...	...	...	...	
1881-82	...	300	...	...	...	...	300	...	...	...	...	
1882-83	...	...	...	...	...	...	...	...	...	...	...	
1883-84	...	...	...	...	...	...	...	...	...	...	...	
1884-85	1,000	...	...	1,000	...	...	...	...	...	...	...	
1885-86	2,928	...	...	2,928	...	...	...	...	...	...	...	
1886-87	6,000	...	5,000	1,000	...	...	...	...	...	...	...	
1887-88	20,900	...	14,500	2,150	1,300	2,950	...	...	...	...	...	
1888-89	26,450	...	13,450	...	...	2,000	...	4,000	5,000	2,000	...	
1889-90	29,500	...	21,500	...	2,000	2,000	...	...	...	...	4,000	
Total ...	86,778	300	F. 54,450 C. ...	7,078	3,300	6,950	... 300	4,000	5,000	2,000	4,000	
Average (6 years) ...	15,000	...	...	...	...	...	...	...	...	...	...	
1890-91	20,425	...	7,425	...	Tumsong. 1,000	1,000	...	...	...	...	9,000	Kyel. 2,000

Sukia Round. (*Nagri Working-Circle.*)

			Tursum.	Silimbong.	Nagri.	Sungma.	Kalijvalley.	Tungsong.	Pubong.	Mundakoti	Mim.	
1880-81	...	1,800	300	1,500	...	...	...	...	...	...	...	
1881-82	...	2,100	600	1,500	...	...	...	...	...	...	...	
1882-83	...	4,548	1,148	600	1,000	1,500	...	...	...	...	...	
1883-84	...	2,569	500	500	1,569	...	...	...	...	...	...	
1884-85	...	5,190	1,178	600	2,716	600	...	...	...	...	...	
1885-86	...	6,810	610	600	1,898	464	1,250	2,000	...	...	...	
1886-87	...	10,379	1,122	600	2,000	851	2,000 Dooteria.	2,410	1,500	...	...	
1887-88	2,500(a)	10,342	2,500(a) 940	806	2,287	2,068	5,000	...	2,172	3,000	...	
1888-89	24,550*	1,500†	4,800* ... †	5,000	5,750	...	...	...	6,500	...	2,500	
1889-90	33,067	...	6,667	100 3,500	... 6,000	400 6,700	... 4,200	...	...	500 5,000	500 ...	
Total ...	59,117	51,438	F. 13,907 C. 6,707	F. 8,500 C. 7,058	F. 11,750 C. 11,458	F. 6,700 C. 5,883	F. 4,200 C. 8,250	F. ... C. 4,410	F. 6,500 C. 3,072	F. 5,000 C. 3,500	F. 2,500 C. 500	
Average	5,913	5,144	...	...	...	...	...	...	...	...	...	
1890-91	35,101	...	8,832	4,045	3,000	4,624	...	Chamong. 4,000	...	...	...	Nagri Farm 7,500

	Mds. of wood.	Equivalent in cubic feet.
Approximate present demand on the two Working Circles taken together	60,000	105,000

Senchal Round. (*Senchal Working-Circle.*)

	Mds.	Mds.	Dooteria.	Kalivalley.
1880-81	...	...	...	...
1881-82	...	...	...	...
1882-83	...	4,000	4,000	...
1883-84	...	1,500	1,500	...
1884-85	...	...	...	...
1885-86	...	4,250	3,000	1,250
1886-87	...	...	...	...
1887-88	...	...	...	...
1888-89	...	...	...	...
1889-90	...	...	...	...
Total ...	...	9,750	8,500	1,250
Average	...	975	...	...
1890-91	...	...	...	...

Mahaldaram Round. (*Mahaldaram Working-Circle.*)

Nil.

Takdah Round. (*Takdah Working-Circle.*)

Year.	Demand for fuel.		Remarks.									
	Firewood.	Charcoal.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.
			Gielle.		Poomong.		Rangli Rangliot.		Lopchu.		Takdah.	
1880-81	3,000	3,100	3,000	1,600	...	1,500	...	...	...	...	...	...
1881-82	...	2,400	...	...	...	1,500	...	900	...	...	...	...
1882-83	2,097	2,500	2,097	800	...	800	...	400	...	500	...	...
1883-84	8,500	683	8,000	400	...	...	500	...	...	283	...	...
1884-85	9,051	...	1,151	...	...	...	900	...	...	...	7,000	...
1885-86	5,800	...	5,600	...	...	...	200	..	...	...	...	...
1886-87	...	..	...	...	...	...	...	...	..	...	...	...
1887-88	160	300	160	...	...	...	...	...	...	...	.	300
1888-89	3,750	200	...	...	...	...	750	200	...	...	3,000	...
1889-90	6,175	...	...	...	...	...	2,175	. .	...	...	4,000	...
Total ...	38,533	9,183	20,008	2,800	...	3,800	4,523	1,500	...	783	14,000	300
Average	3,853	918	...	...	...	...	...	...	...	.	.	...
1890-91	5,600	...	...	...	...	...	1,400	...	...	...	4,200	...

Approximate present demand ... ... Mds. 6,000 = 10,500 cubic feet.

199. A circular was sent to the managers of the tea estates near the forests asking for an estimate of their probable requirements for the next few years. The replies received have been tabulated according to the working-circles from which the supply will probably be drawn. It is not expected that this demand will be made at once, but will be worked up to in a few years. In one or two cases in which no replies were received an estimate has been made for those estates which usually take produce from the reserved forests.

Probable maximum requirements in Timber and Fuel of Tea Planters for the next few years according to the Working-Circles most convenient for them.

Name of tea estate.	Working-Circle.	Probable annual requirements.					Remarks.
		Timber for building.	Timber for tea-boxes.	Firewood.	Wood for charcoal.*	Total in cubic feet solid.	
		Cub. ft.	Sq. ft.	Mds.	Mds.		
.....	Senchal ...	Nil.	Nil.	Nil.	Nil.	...	* In this statement wood for charcoal has been estimated at five maunds of wood per maund of charcoal required.
Singell ...	Mahaldaram ...	...	. .	7,000	10,000	...	
Eden Vale ...	,,	...	4,000	400	1,750	...	
Gyreegong ...	,,	...	6,500	500	2,000	...	
Oaks (Hopetown) ...	,,	750	30,000	1,500	15,000	...	
Mundakoti ...	,,	250	70,000	...	5,000	. .	
Cedars (B. R.) ...	,,	250	15,000	...	...	.	
	Total ...	1,250	125,000	9,400	33,750		
	Equivalent in cubic feet solid.	1,250	5,000	16,000	59,000	81,250	
Takdah ...	Takdah ...	...	. †	4,000	3,000	...	The demand has greatly fallen off in Takdah Circle. Gielle and Poomong tea estates get produce from the Tista valley forests.
Lopchu ...	,,	...	...†	...	4,500	...	
Rangli Rang'lot ...	,,	...	35,000	5,500	. .	...	† Box planking obtained from other sources, probably Sikkim.
Gielle ...	,,	...	35,000	11,000	2,750		
	Total ...	...	70,000	20,500	10,250	...	
	Equivalent in cubic feet solid.	...	3,000	36,000	18,000	57,000	
Rishihat ...	Tasiding ...	...	‡ ..	6,000			‡ Obtained from Sikkim.
Bloomfield ...	,,	...	§ .		10,000	...	§ ,, ,, the estate.
Sidarpong ...	,,	...	¶...	1,500	...		¶ ,, ,, Sikkim.
	Total ...	...	...	7,500	10,000	...	
	Equivalent in cubic feet solid.	...	...	13,000	17,000	30,000	
Kalij valley ...	Possambing ...	...	** ...	...	10,000¶	...	¶ Wood for charcoal has been estimated.
Dooteria ...	,,	...	** ..	...	10,000¶	...	** Box planking obtained from Simri Mota Sirdar's land.
Pubong†† ...	,,	...	35,000	2,000	6,000	...	†† Mallota timber cut in the estate for box planking.
Possambing ...	,,	...	50,000	3,000	10,000	...	
	Total ...		85,000	5,000	36,000	...	
	Equivalent in cubic feet solid.	...	3,500	9,000	63,000	75,500	

Name of tea estate.	Working-Circle.	Probable annual requirements.					Remarks.
		Timber for building.	Timber for tea boxes.	Firewood.	Wood for charcoal.	Total in cubic feet solid.	
		C. ft.	S. ft.	Mds.	Mds.		
Mim	Mim.	...	40,000	20,000	...	...	Estimated.
Tumsong	,,	...	. .	4,000	...	...	*Obtained from Liring and Sikkim.
Lingia . ..	,,	.	. .	4,000		...	
Chongtong L. M. B.	,,	4,500	65,000	13,000	6,500	...	
Chongtong Association	,,	...	...	...	2,000	...	
Marybong	,,	...	...	2,000	...	...	
Kyel	,,	..	17,500	4,000	1,500	...	
	Total ...	4,500	122,500	47,000	10,000	...	
	Equivalent in cubic feet solid.	4,500	5,000	82,000	17,000	108 500	
Nagri Farm ...	Nagri.	..	60,000	3,000	11,500	...	
Nagri	,,	1,000	50,000	6,500	9,000	...	
Sungma	,,	...	2,200	5,000	8,000	...	
Turzum	,,	...	30,000	4,500	5,500	...	
Silimbong	,,	...	20,000	5,000	...	...	
Chamong	,,	...	25,000	...	5,000	...	Estimated.
	Total ...	1,000	187,200	24,000	39,000	...	
	Equivalent in cubic feet solid.	1,000	7,500	42,000	68,000	118,500	

ABSTRACT.

Working-Circle.	Timber for building.	Timber for tea boxes.	Total timber.	Fuel.	Total timber and fuel.
	C. ft.	C. ft.	C. ft.	C. ft.	C. ft.
Senchal*	...	...	...	...	...
Mahaldaram	1,250	5,000	6,250	75,000	81,250
Takdah	...	3,000	3,000	54,000	57,000
Tasiding	...	...	..	30,000	30,000
Posambing	...	3,500	3 500	72,000	75,500
Mim	4,500	5,000	9,500	99,000	108,500
Nagri	1,000	7,500	8,500	110,000	118,500
Add— for contingencies	7,250	...	7,250	...	7,250
Total ...	14,000	24,000	38,000	440,000	478,000

* The demand has been entered against Mahaldaram Working-Circle. A part may, however, if available, be supplied from blocks of the Senchal Working-Circle near Sonada.

200. The following remarks regarding the market for fuel on tea plantations may not be out of place here. Hardly twelve years ago the use of charcoal was essential for tea manufacture, but the introduction of machinery for drying tea by means of hot air has quite changed this, and wood fuel must now compete with coal. In consequence, however, of the more extensive use of machinery for rolling, sifting, and other processes of tea-manufacture, which were formerly done by hand, the demand for fuel has increased. Tea-drying machines only gradually took the place of the old-fashioned charcoal fires, and the cost of coal is so great as to compete with wood fuel only in a few plantations situated close to the Railway, and having little or no firewood on the estate. As the price of tea declined, the necessity for more economical working made itself felt. One result of this has been that water-power, where obtainable, has taken the place of steam-power for driving machinery. In such cases the latter is used only when the former is not available, as in seasons of drought. A certain quantity of fuel, then, is generally required as a reserve in case of failure of the water-supply, besides the supply essential for drying the tea. But, as the reserve fuel may remain stored for a long period without the need for using it arising, it is clear that other things being equal, it would be preferable to lay in a stock of fuel which is not perishable and will occupy a small space, and so save the cost of building large fuel godowns. Coal satisfies these conditions better than wood. It has also the advantage that it can be obtained at comparatively short notice, even during the rains, which is not the case with wood. The bulk of wood is, moreover, about six times that of an equivalent of coal, and its efficiency as engine fuel only about half that of an equal quantity by weight. It follows, then, that where coal and firewood can compete, the price of firewood at the factory must be somewhat less than half the

price of an equal weight of coal, in order that it may be more economical than the latter. It will be seen below that it is actually nearly twice as economical.

As already noted, in paragraphs 187 and 188, coal is sold by the Darjeeling-Himalayan Railway Company, and a reduction in the price was notified, under date the 10th September, to take effect from 1st October 1891, the prices being fixed as under for quantities of ten maunds and more:—

	Rs.	A.	P.
At Kurseong Railway Station	0	13	6
„ Tung „ „	0	13	9
„ Sonada „ „	0	14	0
„ Goom „ „	0	14	6
„ Darjeeling „ „	0	15	0

This notice appeared in the *Darjeeling News* of the 26th September 1891, side by side with a note, published by the Vice-Chairman of the Darjeeling Municipality, and dated the 24th August, in which the Divisional Forest Officer had explained the arrangement concerted with the writer of this report, by which it was proposed to relinquish to dealers the retail trade in fuel in the station of Darjeeling. These last arrangements included a reduction of Re. 1 per cord of firewood sold in the forest, with effect from the 1st October 1891. It thus clear that wood fuel has to complete with a coal monopoly.

The relative cost of firewood, compared with that of an equal weight of coal, delivered at a tea factory, say within six miles of the Railway, appears to be as follows:—

	Rs.	A.	P.
Cost of 50 maunds of coal at Sonada, at annas 14 a maund ...	43	12	0
Carriage, say, six miles to Factory „ „ 3 do. ...	9	6	0
Total ...	53	2	0

The firewood cut in the forest near Sonada has to be carried 1½ to 2 miles further, but that makes no difference, as only one trip could be made in either case; so we have—

	Rs.	A.	P.
Royalty on 50 maunds of firewood at Rs. 3	3	0	0
Cutting 50 „ „ „ 2-2	2	2	0
Carriage of 50 „ „ annas 3	9	6	0
Total ...	14	8	0

If we double the amount so as to obtain the cost of 100 maunds of firewood (equivalent to 50 maunds of coal), we have Rs. 29 only, showing a saving of Rs. 24-2 for every hundred maunds of wood used.

The Acting General Manager has been so good as to supply the following information regarding the sale of steam coal to the public by the Darjeeling-Himalayan Railway during the years 1889 and 1890:—

Name of Station.	1889.	1890.
	Mds.	Mds.
Darjeeling	6,322	6,600
Kurseong to Goom ...	898	1,480
Total ...	7,220	8,080

A request for a reduction in the rates for firewood and charcoal over the Darjeeling-Himalayan Railway was referred to the Board of Directors, who, however, expressed their unwillingness to reduce the rates, though they agreed to reduce the minimum quantity of firewood from 500 too 100 maunds. (*See* paragraph 187.)

201. *Sources from which supplied.*—Timber. Building timber, especially heavy beams, are naturally obtained as close at hand as possible, and if not

available on the property are brought from the nearest or cheapest source of supply, which in some cases happens to be the reserved forest. (*See* paragraph 198). The outturn of private forests during the last year or two is considered in paragraphs 203 and 204.

Timber for tea boxes is to a large extent derived from other sources than the reserved forests about Darjeeling. Its importation from Sikkim and other places may be specially attributed to the fact that the most suitable trees—tún, walnut, pipli, mowa, alder, &c.—are comparatively scarce in the Darjeeling forests, which are for the most part at too great an elevation for these species. (*See* paragraph 49, auxiliary species). It is therefore advisable to introduce some fast-growing kind of exotic tree, such as cryptomeria (as recommended by Dr. H. Mayr in the Indian Forester for February 1887), or to plant extensively in the most suitable localities, *i.e.*, in the lower parts of the forests near tea-estates, the trees named above or others more appropriate to the locality, and of which the timber is suitable for tea-boxes. If cryptomeria is used, it must be planted closely to obviate the growth of low branches and the formation of knots.

The importation of ready-made tea-boxes from Japan has recently been under the consideration of the Conservator of Forests, and it is believed of the Inspector-General of Forests also, and it is consequently unnecessary to go deeply into the matter here. There can be hardly any doubt that on plantations where an equally good box can be made with as little trouble and expense from timber obtained locally, Japanese boxes will not be used unless somebody gains by their use. It seems that the agents make a profit on imported boxes, and that managers are not always sufficiently independent to make their own arrangements in such matters, without reference to the wishes of the agents. Wood fuel is obtained partly from the reserved forests, partly on the tea estates; and charcoal principally from other sources.

202. *Cost of cutting and delivery at market.*—Owing to the very different conditions in which tea estates may be placed, it is impossible to give full information under this head. Building timber delivered at site should not cost more than As. 12 to Re. 1-4 per cubic foot, inclusive of royalty. Tea-box wood of the best quality, *i.e.*, tún wood, often costs as much as Rs. 55 per thousand square feet of half-inch planking, delivered at the factory; say about 40 cubic feet. Tún wood is now chiefly brought from Sikkim, and the royalty is Rs. 5* per 1,000 square feet of planking; thus the cost of cutting and delivery in this case absorb Rs. 50. The cost of sawing is Rs. 20 per 1,000 feet, leaving Rs. 30 for carriage, stacking at factory, and the contractor's risk and profit. The risk consists in the men absconding after getting advances, and this happens somewhat often owing to the proximity of the frontier. Tún wood weighs about 34lbs. per cubic foot, so that 1,000 square feet of box-planking would give about 17 loads of 80lbs., by no means an unusual weight for a coolie to carry for 10 miles in a day, receiving as wages 3 to 4 annas. If we allow Rs. 10 per 1,000 square feet of planking to cover the cost of stacking at the factory, as well as for the sirdar's profit which is very liberal, the balance of Rs. 20 would suffice for the carriage of the planks for about 50 miles. It is not likely, however, that the wood is carried so far, nor that tún is even found in Sikkim at such a distance from the garden importing it. It is far more likely that the contractors are making very large profits at the expense of the forest owner and of the tea planter.

* The rate formerly paid was Rs 2-8 per 1,000, but has been raised by the British Resident, Mr. J C. White.

Tea-box planks of kawla, champ, tarsing and other hill trees cut at Liring on Cheboo Lama's estate cost Rs. 45 per 1,000 square feet delivered at Chongtong tea factory, a distance of about 10 to 12 miles, thus:—

	Rs.
Royalty	... 4 per thousand square feet.
Cutting	... 20 „ „ „ „
Carriage	... 14 „ „ „ „
Contractor's profit ...	... 7 „ „ „ „

The weight of the wood may be taken as about 38lbs. per cubic foot, making 19 loads of 80lbs. each for every 1,000 square feet of planking. The cost of carriage would seem to be about three times as heavy as it should be.

Fuel.—An example has been given above (in paragraph 200) in contrasting the cost of firewood and coal taken from Sonada. The Manager of the Gielle Tea Estate wrote as follows in December 1890:—"For this season I have had the greatest difficulty in getting our contracts taken up at Rs. 28 per 100 maunds of firewood, and if I have to go much higher, it will be a question if it is not better for us to burn coal."

In this case the wood was chiefly sâl wood obtained from the Tista Valley forests at a distance of about nine miles. The royalty was Re. 1-8 per cord; say Rs. 3 per 100 maunds. The cost was as follows:—

	Rs.	
Royalty	3	per hundred maunds.
Cutting, carriage and sirdar's profit, 100 maunds, @ annas 4 a maund ...	25	„ „
Total ...	28	

The work had to be done in a hot and unhealthy valley, and the carriage was all up hill. The details of the cost have not been communicated, but may be divided thus:—

	Rs.	A.	
Royalty	3	0	per hundred maunds.
Cutting	4	8	„ „
Carriage at annas 3 a maund ...	18	12	„ „
Sirdar's profit	1	12	„ „
Total ...	28	0	

Owing to the absence of main lines of export to the several centres of the tea industry, the cost of transport often varies from one estate to another. Produce is for the most part carried by coolies, but pack ponies are sometimes employed. Tea has to be carried up from the tea factories to the railway, and so each tea garden must keep a sufficient staff of strong male coolies for the service. These men are generally employed during part of the cold weather in carrying stores, fuel and other supplies to the garden, and in making charcoal on the estate or in the forests.

N.B.—Charcoal is to a large extent obtained from Sikkim, especially by gardens north of the forest tract and near the Sikkim frontier. The average cost of making and delivery is as follows:—

	Rs.	A.	P.	
Royalty	0	2	0	per maund.
Manufacture	0	4	0	„
Carriage about annas 10 to	0	12	0	„
Sirdar's profit, say ...	0	2	0	„

Cost at Factory Re. 1-2 to Re. 1-4. In one or two of the more remote gardens the cost is as much as Re. 1-6 a maund. It is worthy of consideration whether improved means of transport, partly by wire ropes and partly by floating in a channel or trough, could not profitably be employed for the export of forest produce from the Goompahar forest to a convenient central point in the Balasan valley (*e.g.*, Namsu), in which neighbourhood are many tea estates almost totally denuded of wood. It is probable that with a good cart road from Sukiapokri to the Singalilà forest, inexhaustible supplies, both of timber and fuel, could be sent down if such a direct line of export were established. It is a question of demand and cost, and these points should be studied.

Produce, obtained from private forests.

203. As far as known, the following are the chief sources of supply about Darjeeling in addition to the reserved forests. The produce considered is that which may be said to compete with or supplement the outturn of the Government forests, and which, other sources failing, the latter would be called on to supply.

(*a*) *Riliiny or Lirng.*—Part of Cheboo Lama's estate, owner Rinchôk Dewan.

Area of forests.—Probably under 10 square miles.

Distance from Darjeeling, about 20 miles.

Lines of export.—Carriage by coolies to Sukiapokri, thence cart road to Darjeeling. Various hill-paths leading to tea estates are also used.

Description and quantity of produce exported.—The following is a rough estimate of the exports of last year:—

Description.	Approximate quantity exported.		Market supplied.
	Sale measurement.	Cubic feet.	
Building timber ...	71,000 { Conventional running feet. }	7,000	Darjeeling.
Tea-box planking ...	75,000 square feet	3,000	Tea plantations.
Charcoal ...	10,000 maunds	90,000	Tea plantations.
Ditto ...	1,500 „	13,000	Darjeeling.
Total ...	.....	113,000	

This source of supply was not worked for building timber before 1890-91. Its exploitation was due to the extension of the Goompahar cart road and a stricter control over the marking of trees for timber introduced in the reserved forests in the previous year.

Aconite, wax, honey, and chiretta are exported to some extent, but particulars have not been ascertained.

Rates paid by dealers.—One Ratay Bhutia is said to have paid Rs. 1,420 to obtain a lease of this forest for sixteen months; in addition to which he pays a royalty of Rs. 5 per thousand conventional running feet of scantling, and 2 annas per maund of charcoal removed. The Dewan, however, exercises no check on the quantities removed. Standing trees, it must be noted, are not sold at a fixed price, but a royalty is charged on the sawn timber.

The lessee charges his customers Rs. 6 per thousand conventional running feet for timber of all kinds except walnut, tún, and pipli, and 3 annas per maund of charcoal; but there are other customary charges; namely, a fee of Re. 1 on taking out a permit to cut and collect produce in the forest, and 8 annas every time that delivery of scantlings is taken, and the pass for their removal obtained. No notice is taken of damage done to the forest, whether by careless felling, by fire, or in any other way. The risk of manufacture of charcoal, involving waste by imperfect carbonisation, and loss by fire owing to neglect of the kilns, is borne by the forest owner. Sawyers are allowed to encamp where they please; whereas in the reserved forests they have to return to the authorized camping grounds after their day's work is done.

The conventional measurement adopted for building timber takes into account the size of the scantling, thus:—

Ordinary dimensions of building timber exported.	Length at which each piece is conventionally reckoned.	Actual number of running feet per conventional thousand feet.	Cubic feet per conventional thousand feet.	Corresponding royalty paid by the lessee per cubic foot.
	Feet.			
12′ × 12″ × 1″	12	1,000	83·33	} Nearly 1 anna.
12′ × 12″ × 1½″	18	667	83·33	
12′ × 6″ × 4″	18	667	83·34	
12′ × 3″ × 1½″	4	3,000	93 75	About 10 pies.
12′ × 3″ + 2″	5	2,400	100 00	„ 9½ „
12′ × 9″ × 1½″	10	1,200	111·60	„ 8½ „

The price paid by the dealers to the lessee is one-fifth more than these rates, *plus* the fees paid as stated above.

Independently of the lease given to Ratay Bhutia, the proprietor is bound by previous agreements to sell timber and fuel to some tea concerns at rates fixed for a certain number of years.

It is believed that in most cases these agreements run to the end of 1896. Particulars have not been ascertained.

Cost of cutting and delivery at market.

Timber.

	Rs.	A.	P.	
Royalty, say	0	1	0	per cubic foot.
Sawing	0	4	6	ditto.
Carriage by coolies to Sukiapokri ...	0	6	0	ditto.
Carting from Sukiapokri to Darjeeling ...	0	2	0	ditto.
Total ...	0	13	6	

Average selling rate in Darjeeling, Re. 1 to Re. 1-4 per cubic foot.
Dealer's profit, As. 2-6 to As. 6-6 per cubic foot.

Charcoal.

	Rs.	A.	P.	Rs.	A.	P.	
Royalty paid to lessee				0	3	0	per maund.
Cost of manufacture				0	4	0	ditto.
Carriage by coolies to Sukiapokri ...	0	4	0 to	0	5	0	ditto.
Carting from Sukiapokri to Darjeeling				0	3	0	ditto.
Total ...	0	14	0 to	0	15	0	ditto.

Average selling rate in Darjeeling, Re. 1-2.
Dealer's profit, As. 3-0 to As. 4-0.

(*b*) *Góke.*—The estate of Rajah Tenduk Pulger.
Area of forest.—Probably under 10 square miles.
Distance from Darjeeling, about 10 miles.

Lines of export.—To Darjeeling produce is carried by coolies *viâ* Tukvar, but very little is taken to that market. Last year the forest was leased to Mr. Christison, Lebong Tea Company, Tukvar, for ten years on the terms stated below:—

Description and quantity of produce exported.—Full information is not obtainable, but the following has been ascertained:—

Description.	Approximate quantity exported.		Market supplied.
	Sale measurement.	Cubic feet solid.	
Timber ...	1,000 c. ft.	1,000	Darjeeling, 1890.
Firewood ...	5,000 mds.	8,750	Lebong Tea Company's annual demand on the Rajah's forest.
Charcoal ...	3,500 „	24,500	
Total ...	.....	34,250	

Rates paid by the lessee.—The Rajah got an advance of Rs. 5,000 on granting the lease. The royalty on charcoal is 2 annas a maund and firewood 1 anna a maund from dead trees. The lessee is not allowed to cut good trees. The Rajah is unable to give details of the outturn of his forest, but was credited with Rs. 3,500 for last year. That is considerably more than the value of the produce shown in the above statement.

(*c*) *Municipal land*, situated between Jorbungalow and Goompahar.
Area of forest, about 100 to 200 acres.
Distance, from Darjeeling 4 to 5 miles.
Lines of export—Cart-roads to Darjeeling and Jalapahar.

Description and quantity of produce exported.—It is necessary briefly to describe the conditions by which the Municipality are bound in respect of the forest lands held by them. Information on this subject is contained in

Government of Bengal's letter No. 77T, dated 21st June 1880, to the address of the Commissioner of the Rajshahye and Cooch Bihar Division, paragraph 5, where it is laid down that the Municipality "are not at liberty to cut any standing timber either on Goompahar or on the locations held by them as grazing grounds, without special reference to Government. They may sell to the Forest Department any fallen timber suitable for fuel or other purposes, and may derive any revenue they can from bamboos and grass, but must not cut any trees without permission."

In May 1887 about 13,000 maunds of fuel were sold by auction without reference to the Forest Department. The case was reported to Government, but was afterwards condoned by the Conservator of Forests. In 1889 another case occurred. On this occasion a lump sum of Rs. 250 was paid, and the out turn is reported to have been as follows:—

Timber	about	... ...	300	cubic feet.
Firewood	„	15,000 maunds =	26,250	„
		Total ...	26,550	

This is quite compatible with the list given in Vice-Chairman's letter No. 19, dated 7th April 1890. Numerous standing trees or stumps said to have been dry were sold. No notice was given to the Forest Department, and although it is said that tenders were invited by beat of drum, only one tender, that of the purchaser, was received. This would certainly not have been the case had proper notice been given, and several dealers complained that public notice was *not* given.

Government is supposed to provide for the reproduction of forest on these lands, but nothing is done towards it. The land is steep and much ravined, the upper part denuded of timber, and, except for grazing and the building of a few shops and huts, is not put to much use. The forest is found chiefly in the lowest part of the block, *i.e.* furthest from the road. Very few trees are fit for timber or for reproduction, which must be effected by planting. As dead wood has been recently cleared out and standing trees are not to be cut, this source of supply may be neglected in estimating for the future.

(*d*) *Achay Lall's land*, in the Rangbong valley just below the reserved forest.
Area of forest, about one square mile.
Distance from Darjeeling, about 15 miles.

Lines of export.—This forest has been made accessible by the extension of the Goompahar cart road to Gairibash. The produce has to be carried up by coolies through the reserved forest to this point, and is then carted.

Description and quantity of the produce exported.—Very little material has hitherto been exported to Darjeeling (about 1,000 cubic feet of timber in 1890). The rates for timber trees are nearly the same as in the reserved forest, which is closer to the cart-road.

(*e*) *The Maharajah of Burdwan's land*, near Sonada.
Area of forest, not exceeding one square mile.
Distance from Darjeeling about nine miles, from Kurseong ten miles.

Lines of export.—The hill cart road (Darjeeling-Himalayan Railway) to Darjeeling and Kurseong and paths from Sonada to tea plantations on Hopetown Spur.

Description and quantity of produce exported.—The forest is not regularly worked. In 1889 and 1890 about 37,000 maunds of firewood were exported to Darjeeling. This was cut from dry and fallen wood (mixed wood), for which a royalty of Rs. 6 per hundred maunds was paid.

The small piece of forest belonging to the Maharajah, north of Jorbungalow, has been almost entirely cleared during the two years 1889 to 1891. The outturn was—

Timber	about	... ...	7,000	cubic feet (of scantling).
Firewood	„	65,000 maunds =	114,000	„
		Total ...	121,000	

The royalty paid for the timber was 4 annas per cubic foot. The firewood was obtained from standing trees, which were paid for according to girth at Rs. 10 and upwards for búk and phalát; Rs. 5 and upwards for kawla and other kinds. The price per hundred maunds of firewood is not known.

(*f*) *Hopetown land*, at Sonada.

Area of forest.—Probably less than one square mile.

Firewood obtained from dry and fallen trees has been exported to Darjeeling during the last two or three years; about 5,000 to 7,000 maunds a year. The royalty charged is reported to be Rs. 12 per hundred maunds for búk and Rs. 10 for other kinds; but these rates seem to be unlikely.

(*g*) *Sikkim.*

Area of forest not known.

Distance, from the frontier to Darjeeling about 20 miles.

Lines of export.—Chiefly *viâ* Badamtám and Takvar to Darjeeling, and by various other paths to tea plantations.

Description and quantity of produce exported.—The following is a rough estimate:—

Description.	Approximate quantity exported.		Market supplied.
	Sale-measurement.	Cubic feet.	
Building timber sâl ...	...	20,000	Darjeeling.
„ „ tún ...	...	1,000	Ditto.
	Sq. feet.		
Timber for tea-boxes ...	1,000,000	42,000	Tea plantations.
	Mds.		
Charcoal	50,000	350,000	Ditto.
Ditto	3,000	21,000	Darjeeling.
Total ...	..	434,000	

Note.—Since this report went to press Mr. White has given the following as the outturn for 1891:—

Tún planking	...	...	411,000 S.ft.
Charcoal	...	...	3,000 Mds.
Scantlings, sâl	...	...	1,000 C.ft.
Sleepers, „	...	...	1,000 „
Other scantlings	...	...	1,000 „

* It is expected that a large quantity of sâl will be sold next year; the supply being drawn from Chidum, Kutam, &c.

During the Sikkim expedition, and for some time previous to it, considerable quantities of timber, and many thousands of maunds of charcoal were brought into the Darjeeling district from Sikkim; and much damage was done to the forest there. It is reported that Mr. J. C. White, the British Resident, has since put a stop, if not to the excessive nature of the fellings, at any rate to the unauthorized removal of produce; but it is not clearly understood why the Sikkim forests are not placed under the professional management of the Forest Department; or at least subjected in some degree to the control of the Conservator of Forests, Bengal.

Rates paid by dealers.—The rate of royalty on tún tea-box planking is Rs. 5 per thousand square feet. Other rates have not been ascertained.

Cost of cutting and delivery.—Information is scanty, but it has been ascertained that the cost of the timber used in the construction of St. Joseph's

College, Darjeeling, and which has been mostly imported from Sikkim during the past four years, was as follows:—

Description.	Approximate quantity consumed.		Cost.
	Sale-measurement.	Cubic ft.	
Sâl and búk beams ...	.....	40,000	Rs. Rs. 1-4 to 1-5 per c. ft.
	Sq. ft.		
Sâl boards	35,000 × 1½" and 1'	3,500	1-2 to 1-5 „ „
Champ boards ...	50,000 × 1½"	6,250	1-3 to 1-4 „ „
Ditto	15,000 × 1"	1,250	
Tún planks ...	6,000 × 1"	500	12-0 per 100 sq. feet.
Ditto	25,000 × ¾"	1,560	7-8 „ „
Ditto . .	5,000 × ½"	200	6-0 „ „
		53,260	

On an average the cost of cutting and delivery at Darjeeling of the sâl timber was as follows:—

	A.	P.				
Royalty (about)	2	0	per cubic foot.			
Sawing	4	6	ditto.			
			Rs.	A.	P.	
Carriage by coolies	6	0	to	0	12	0
Total ...	15	6	to	1	2	6

204. Abstract of outturn of private forests as given above.

Locality.	Timber for building, etc.	Timber for tea-boxes.	Total timber.	Fuel; exported to—		Total timber and fuel.
				Darjeeling	Tea plantations.	
Rilling	7,000	3,000	10,000	13,000	90,000	113,000
Goke	1,000	(?)	1,000		33,000	34,000
Municipal land	*	.	.	10,000†		10,000
Achay Lal's ,, ...	1,000	(?)	1,000		(?)	1,000
Maharajah of Burdwan's .	3,500	(?)	3,500	57,000	(?)	60,500
Hopetown land (Sonada) ...	(?)	(?)	(?)	6,000	(?)	6,000
Sikkim	21,000	42,000	63,000	21,000	350,000	434,000
Total ...	33,500	45,000	78,500	107,000	473,000	658,500

* Quantity very small. † Average of four years 1887—90.

It seems certain that the supplies now drawn from private forests and from Sikkim must be fully equal to, if they do not exceed, the total capability of the forests treated of in this report; and many of these sources of supply cannot fail to be exhausted within the next ten or twenty years. It is therefore a matter of some urgency to open up the Singalilà forest.

205. *Other markets.*—At Sonada and Kurseong, and in a few scattered hamlets along the Darjeeling-Himalayan Railway, a certain quantitiy of timber, fuel, and fodder is consumed. Kurseong is partly supplied by forests of the Kurseong Division, partly by the Mahaldaram forest, and partly by private forests belonging to the Maharajah of Burdwan and to Goga Ram Modi. Sonada Bazar and the small clusters of huts between Tung Railway Station and Jorbungalow draw their supplies partly from the reserved forests and partly from private forests. In the Kurseong Municipality the population is about 3,600 souls, but this includes the Dow Hill School, the Kurseong Forest Officer's headquarters, the Clarendon Hotel, and some tea estates. Some coal is used, and some of the tea plantations have private supplies of fuel. It will be safe to take the population to be supplied as numbering about 1,800 souls, and allow for timber and fuel together about 40 cubic feet per head per annum, which gives 72,000 cubic feet. Of this about 20,000 cubic feet may be taken as the demand upon the Darjeeling forests (Mahaldaram). For Sonada and other consumers we may estimate about 5,000 cubic feet. Total demand for timber and fuel 35,000 cubic feet. A certain number of bullocks and pack ponies ply on the cart road between Kurseong and Darjeeling. Grazing is permitted for

the draught cattle, but fodder is taken out for them also. Allowance should be made for about 40 or 50 loads of fodder daily for pack animals, say 17,000 maunds a year, of which about two thirds must probably come from the reserved forests, *i.e.*, about 11,000 maunds.

206. *Produce consumed by right-holders and others.*—There are no right-holders; but under this head it will be convenient to consider the quantity of timber and fuel consumed by free-grantees, graziers living in the forests, travellers, and workmen employed by purchasers. In the Deputy Commissioner's preliminary Census Report the number of houses per square mile of forest in the sudder charge is stated to be 1·7, and the number of persons per house to be 7·1. Thus there would be about 12 persons per square mile, or, allowing about 10 per cent. for extra coolies camping out in the jungle, approximately 500 persons for the 38 square miles of forest with which we have to deal. A liberal allowance must be made for persons living in the forests, who do not pay for the fuel they consume, and 100 cubic feet per annum does not seem too much for the timber (poles, slabs, etc.) and fuel consumed by each individual; say 50,000 cubic feet in all. Fodder is allowed to graziers free. For 64 bathans we may allow 200 loads a day, or say 74,000 maunds in the year.

207. *Summary of estimated current annual demand for timber, fuel and fodder, showing the sources from which it is probably supplied.*

Market and description of produce.	Estimated current demand.			Remarks.
	Reserved forest.	Other sources.	Total.	
(i) Darjeeling.				
(Including Jorbungalow and Goom Bazars)				
Timber ... ... C.ft.	100,000	50,000*	150,000	* Probably a low estimate.
Fuel .. .. ,,	400,000	80,000	480,000	
Total ... ,,	500,000	130,000	630,000	
Fodder .. Mds.	73,000	40,000	113,000	
(ii) Jalapahar.				
Timber ... ... C.ft.	5,500†	...	5,500	† If barracks are built at Lebong there will be a further special demand of about 50,000 cubic feet spread over two years.
Fuel ... ... ,,	90,000	..	90,000	
Total ... ,,	95,500		95,500	
Fodder ... Mds.	42,000	...	42,000	
(iii) Tea Plantations.				
Timber ... ... C.ft.	30,000	45,000	75,000	
Fuel ... ... ,,	160,000	473,000	633,000	
Total ... ,,	190,000	518,000	708,000	
(iv) Other demands.				
(a) Sonada, Kurseong and hamlets along Darjeeling-Himalayan Railway.				
Timber and fuel ... ... C.ft.	25,000	50,000	75,000	Proportion of timber to fuel may be assumed to be 20 80.
Fodder .. Mds.	11,000	5,000	16,000	
(b) Forest population.				
Timber and fuel ... ... C.ft.	50,000	...	50,000	Free of cost.
Fodder ... Mds.	74 000	.	74,000	Ditto
Grand total, Timber and Fuel ... C.ft	860 500	698,000	1,558,500	Say 1,560,000.
Ditto Fodder Mds.	200,000	45,000	245,000	,, 250,000.

The above is only a rough estimate as regards supplies drawn from "other sources."

CHAPTER XIV.

PAST REVENUE AND EXPENDITURE.

208. The summary of revenue and expenditure for the 10 years 1880-90, given below, has been prepared by deducting the figures for the Singalilà forest since it was constituted a reserved forest, *i.e.*, from 1882-83; and also the sum of Rs. 15,000, the purchase-money paid for this forest in 1881-82; and Rs. 6,222 paid in 1884-85 (see note to paragraph 209 below). The share of expenditure on office and controlling establishment cannot be separated, but it is insignificant.

209. The financial results, as exhibited in the column "Net Revenue," of the statement given below show a loss of Rs. 25,259 in the first half of the decade, and a profit of Rs. 67,162 during the last five years, thus:—

Year.	Deficit.	Year.	Surplus.
	Rs.		Rs
1880-81 ...	1,212	1885-86	4,820
1881-82 ...	16,745	1886-87	11,331
1882-83 ...	386	1887-88	16,040
1883-84 ...	3,006	1888-89	16,442
1884-85 ...	3,910	1889-90	18,529
Total ...	25,259	Total	67,162

The difference, Rs. 41,903, gives an average net surplus of Rs. 4,190 a year for the 10 years.

Summary of Revenue and Expenditure for the ten years, 1880 *to* 1890.

Year.	Heads.	Gross receipts.	Expenditure directly debitable to heads I and Others.	Net value of produce sold.	Expenditure. Roads and buildings.	Other forest improvements.	Stores and Miscellaneous, 'A'.	Establishment 'B'.	Total.	Grand total expenditure, 'A' and 'B'.	Net revenue.
1880-81 ...	I ...	46,191	34,033	12,158	8,597	2,101	1,404	14,699	26,801	60,873	—1,212
	Others..	13,470	39	13,431							
	Total ...	59,661	34,072	25,589	8,597	2,101	1,404	14,699	26,801	60,873	
1881-82 ...	I ...	42,262	36,415	5,847	19,196	5,084	625	14,014	38,919	75,337	—16,745
	Others...	16,330	3	16,327							
	Total ...	58,592	36,418	22,174	19,196	5,084	625	14,014	38,919	75,337	
1882-83 ...	I ...	43,244	30,523	12,721	4,294	18,465	1,018	17,024	40,801	71,335	—386
	Others...	27,705	11	27,694							
	Total ...	70,949	30,534	40,415	4,294	18,465	1,018	17,024	40,801	71,335	
1883-84 ...	I ...	26,326	21,500	4,817	6,014	3,502	1,025	19,224	29,765	51,632	—3,006
	Others...	22,300	358	21,942							
	Total ...	48,626	21,867	26,759	6,014	3,502	1,025	19,224	29,765	51,632	
1884-85 ...	I ...	26,413	27,567	—1,154	3,216	5,238	471	21,891	30,816	58,702	—3,910
	Others...	28,469	409	28,060							
	Total ...	54,882	27,976	26,906	3,216	5,238	471	21,891	30,816	58,702	
1885-86 ...	I ...	24,230	17,420	6,810	6,550	2,962	250	12,259	22,011	39,881	+4,820
	Others ..	20,471	450	20,021							
	Total ..	44,701	17,870	26,831	6,550	2,962	250	12,259	22,011	39,881	
1886-87 ...	I ...	39,428	27,060	12,368	3,851	2,323	246	15,932	22,352	50,115	+11,331
	Others.	22,018	703	21,315							
	Total ...	61,446	27,763	33,683	3,851	2,323	246	15,932	22,352	50,115	
1887-88 ...	I ...	36,231	26,889	9,342	3,508	2,850	572	11,356	18,286	45,938	16,040
	Others .	25,747	763	24,984							
	Total ...	61,978	27,652	34,326	3,508	2,850	572	11,356	18,286	45,938	
1888-89 ...	I ...	35,858	27,508	7,830	5,387	2,448	590	10,372	18,797	47,098	+16,442
	Others ..	28,202	793	27,409							
	Total ...	63,540	28,301	35,239	5,387	2,448	590	10,372	18,797	47,098	
1889-90 ...	I ...	47,080	34,909	12,171	6,337	1,973	759	15,897	24,966	60,577	+18,529
	Others...	32,026	702	31,324							
	Total ...	79,106	35,611	43,495	6,337	1,973	759	15,897	24,966	60,577	
Average of last 10 years.	I ...	36,674	28,383	8,291	6,695	4,694	696	15,267	27,352	56,158	+4,190
	Others...	23,074	423	23,251							
	Total ...	60,348	28,806	31,542	6,695	4,694	696	15,267	27,352	56,158	

Note.—Direct charges against I Revenue are whole expenditure under AI, half of AII, whole AVIa and AVIb and part of AVI such as purchase of carts, etc.

In the first-half of the decade there was considerable capital expenditure, and the fluctuations in revenue and expenditure from year to year require some explanation to enable us to draw any conclusions from them for future guidance; the following remarks are, therefore, added:—

1880-81.—The forests were worked chiefly by government agency, and the visit of the Inspector-General of Forests gave a fresh impetus in this direction. The gross revenue from departmental operations increased, but the gain was more than counterbalanced by excess expenditure on depôt buildings, the purchase of stores, carts, and cattle, and on the construction of roads primarily intended for the export of fuel to Darjeeling by government agency. Cattle disease was prevalent, and the construction of the Darjeeling-Himalayan Railway also made transport difficult and expensive. Thus there was a considerable falling off in the profits from departmental operations. Under Budget head II (removal of produce by purchasers) there was a decrease in the sale of timber compared with the two preceding years. No change had, however, been made in the price, and the falling off was doubtless due to the Darjeeling-Himalayan Railway having completed its purchases of timber; for there was a considerable increase compared with the revenue obtained in 1877-78 before work on the railway began. The revenue under II*b*, Fuel, increased from Rs. 140 in 1879-80 to Rs. 1,088 in 1880-81.

1881-82.—Departmental operations became still less remunerative and were partly relinquished to private enterprise. Receipts under II*b* were thus increased by Rs. 2,900, whilst the sale of trees on permit yielded Rs. 2,225 more than in the previous year, owing to extensive building works in Darjeeling and the construction of the Goompahar cart road.

Capital expenditure was incurred on the construction of Goompahar cart road Rs. 17,000. A slight reduction was effected in the cost of establishment; and expenditure on plantations was increased.

1882-83.—A reduction of Rs. 4,000 in expenditure was effected. The Goompahar road was made over to the Public Works Department for completion; and Rs. 14,000 were paid to the Municipality for the Goom forest. At the same time the revenue increased by about Rs. 12,500, most of which was under II. Expenditure on departmental operations was curtailed, while the revenue exceeded that of the previous year owing to sale of depôt stocks. As a result of Dr. Schlich's visit further attempts were made to replace departmental operations by private enterprise, by selling fire-wood to dealers in the forest. Revenue under II*b* was thus more than doubled, whilst extensive building operations in Darjeeling greatly increased the sale of timber, as well as of fuel for brick burning.

The increase is shown thus:—

Year.	No. of trees sold.	Dry and fallen timber.	Revenue, II*a*.	Difference.
		C. ft		
1881-82 ...	627	1,563	9,163	+4,481
1882-83 ...	669	12,866	13,644	

The sales of timber would have been still greater had not prices been raised 50 to 100 per cent. with effect from the 1st January 1883.

Year.	Fuel sold.	Revenue, II*b*.	Difference.
	C. ft.		
1881-82 ...	162,610	3,991	+4,685
1882-83 ..	276,111	8,856	

There was also an increase in miscellaneous receipts of Rs. 1,500.

1883-84.—Depression is apparent under almost every head of revenue, the total decrease being over Rs. 22,000. There was no capital expenditure

for purchase of land, but expenditure on roads and buildings was about Rs. 1,700 in excess of the previous year. Establishment charges were Rs. 2,200 more, and temporary establishment under AII was nearly Rs. 700 in excess.

The decrease of profits from departmental operations (Rs. 8,000 nearly) was due to the fact that the supply of fuel in the station was not wholly abandoned. The sale of firewood was restricted, but that of charcoal was continued; whilst the maintenance of a reserve stock of fuel and the entertainment of the fuel establishment at its full strength prevented a corresponding reduction of expenditure. The decrease of Rs. 2,500 in the revenue from sale of standing trees may be attributed to the enhancement of prices in January 1883.

1884-85.—This year the improvement in receipts was general. The unfavourable position of departmental fuel operations continued; whilst exceptional expenditure* for surveys (Rs. 1,200), together with the increased cost of plantations and temporary establishments, further increased the deficit.

* NOTE.—An extraordinary payment of Rs. 6,222 on account of an encumbrance on the Singalilà forest is excluded.

1885-86.—The Division was converted into a subdivision, and the divisional officer had charge of it in addition to his other duties. In this way a saving of Rs. 7,075 was effected in pay and travelling allowance. Under the head of departmental operations the revenue was sustained by the doubling of the demand for charcoal, whilst a reduction of Rs. 10,000 was made in the expenditure in consequence of a falling off in the demand for fuel for the Commissariat Department. On the other hand, the extra charge of 10 per cent. on the price of trees for every foot in girth above eight feet, introduced with the object of saving the growing timber as much as possible, checked the sale of trees greatly, and diminished the revenue under II*a* by Rs. 10,000 nearly, thus:—

	Number of trees sold.	Value of trees.	Dry and fallen timber.	Value of dry and fallen timber.	Total revenue, II*a*.
		Rs.	C. ft.	Rs.	
1884-85 ...	584	12,990	11,863	2,275	15,265
1885-86 ...	170	3,407	16,635	2,268	5,675

The price of fallen timber was reduced, but the increase in the quantity sold barely made up the previous year's revenue from this source. There was an increase of nearly Rs. 2,000 in revenue from fuel removed by purchasers, and the orders of Government for the reduction of expenditure caused a reduction of Rs. 1,380 in the plantation charges. A payment of Rs. 4,637 on account of the Goompahar cart road, which had been deferred from 1881-82, accounts for the increased expenditure under roads and buildings.

1886-87.—The increase in revenue (Rs. 17,000 nearly) was mostly due to departmental operations, the principal items being firewood sold to the Commissariat Department and charcoal sold to the general public. There was also an increase of Rs. 1,000 in miscellaneous revenue. The expenditure on departmental operations increased by Rs. 9,600, and there was increased expenditure on establishment. The revenue under II increased only by a few hundreds of rupees, principally under timber (II*a*.)

1887-88.—There was a slight increase in the total revenue, but the main cause of the increase in the surplus was the saving effected under salaries and travelling allowances owing to the subdivision being managed by the divisional officer in addition to his other duties. The expenditure under 'A', and especially on roads and plantations, was greater. The demand of the general public upon the depôts was less, more produce being purchased direct from the forest. The improved system of sale of firewood by the cord and charcoal by the bag was introduced, and the price of firewood raised by about Re. 1 per hundred maunds. The revenue from fuel removed by purchasers increased on the whole, but there was a falling off in the sale of firewood and a large

increase in that of charcoal, of which the price had not been raised. The revenue under II*a* increased by Rs. 2,750.

1888-89.—The increase of revenue was fairly general, but most noticeable under II*a*, Timber. thus:—

	Number of trees sold.	Dry and fallen timber.	Revenue under II*a*.
		C. ft.	Rs.
1887-88 ...	270	15,575	8,642
1888-89 ...	401	23,913	14,354

This improvement more than counterbalanced the decrease (over Rs. 3,000) in revenue from fuel sold from the forest, which was due to increased imports of charcoal from Sikkim and of firewood from private forests. The sales of dry sticks increased greatly owing to the reduction in price.

1889-90.—Considerable improvement in the revenue occurred both under heads I and II, which was attributed to the cessation of imports of charcoal from Sikkim. The increase was, however, almost neutralized by an increase of almost Rs. 13,000 in expenditure, of which the chief items are Rs. 5,500 for establishment and Rs. 7,400 for departmental fuel operations. At the same time Rs. 3,500, or almost the whole expenditure on buildings, was devoted to the rebuilding and enlargement of the Darjeeling fuel depôt. There was a larger revenue under II*a*—Timber, owing to extensive building works in Darjeeling, the increase being greatest, Rs. 1,700, in the sale of dry and fallen timber. The sale of firewood from the forest increased slightly as follows:—

Year.	Total cubic feet of wood.	Revenue II*b*.
1888-89 ...	255,050	10,093
1889-90 ...	292,039	10,698

The most satisfactory feature is the steadiness with which the total revenue and the surplus have increased since 1885-86; and the disturbing element seems to be the frequent enhancement of prices.

END OF PART I.

PART II.

FUTURE MANAGEMENT.

CHAPTER I.

DIVISION OF THE AREA INTO WORKING-CIRCLES.

210. Seven Working-Circles have been formed, namely :—

No.	Name.	Area in acres.	Remarks.
(1)	Senchal ...	9,094	For detailed Area Statement see part I, paragraph 12.
(2)	Mahaldaram ...	4,440	
(3)	Takdah ...	2,200	
(4)	Tasiding ...	2,290	
(5)	Posambing ...	1,770	
(6)	Mim	2,405	
(7)	Nagri ...	2,495	
	Total ...	24,624	

This division harmonises well with the administrative charges as now arranged, and at the same time permits of comparison with the old arrangement of forests and blocks without difficulty, so that previous records are not rendered useless. Thus Working-Circles Nos. 1 to 3 constitute the tract east of the Darjeeling-Himalayan Railway *plus* the Dooteria block, and, together with the Tista Valley round, forms the present Eastern Range. Working-Circles Nos. 4 to 7, on the other hand, comprise the whole of the Goompahar forest. The Singalilá forest, which forms a separate forester's round, in accordance with the Inspector-General of Forest's letter No. 1006, dated 31st December 1890, is combined with the Goompahar forest to form the Western Range.

211. The above division into Working-Circles is at the same time most convenient for the supply of the various markets. It is indicated by the configuration of the country and existing lines of export, and also takes into consideration the future arrangements to be made for economical transport. The grouping in appropriate periodic blocks of those parts of the forest which have already been worked is also best secured by the division adopted.

212. The statements of five years' outturn of each of these Working-Circles, given in Appendix V, the facts recorded in Chapter XIII, and the relative position of the forests and the tea estates, show that the Goompahar forest and the Mahaldaram and Takdah Working-Circles are the most convenient for the supply of the tea-concerns. Provision is thus made to the fullest extent for the important interests of the tea-industry, which were urged (on behalf of plantations north of the Goompahar forest) in a petition, dated the 22nd November 1887, to the address of the Deputy Commissioner and submitted to Government under cover of the Commissioner's letter No. 930 Rct., dated the 27th December 1887.

213. But it is to be understood that none of these Working-Circles are absolutely reserved for the supply of any particular market, just as there is no guarantee on the part of any market or tea-concern to take the whole of the produce annually available. The entire tract might have been made into one or two large Working-Circles, as intended by Mr. Chester, were it not that the markets are found on all sides of the forest, and that the topography of the country prevents the distribution of the produce with equal facility in every direction. Under these circumstances it would be manifestly inconvenient to establish only one or two series of age-classes over the whole area. It is

desirable that each important market should at all times be able to obtain mature timber within a reasonable distance in that part of the tract most convenient for its supply, and this has been secured as far as possible by the present division into Working-Circles, and by the arrangement of the periodic blocks in each.

214. The large Senchal Working-Circle, on which the planters make little or no demand, is by reason of its position best suited for the supply of Darjeeling and Jalapahar. On the east, where the best stocked areas are found, the forest adjoins the Government cinchona plantations, which make no demand on the forest. On the west it is situated above the railway, and by far the greater part of the whole area of the circle is above the level of Jorbungalow; and so with a carefully aligned system of roads the load will be in favour of the gradient over a large area. On the contrary, the Goompahar Cart-road constructed to tap the forest of that name is too near the top of the range, and it rises and falls too much to permit of economical working, though it is still an important export road for the forest within a short distance on either side of it. It will, no doubt, become the main export line for the Singalilá forest when a cart-road is made from Manibanjan to Sukia-Pokri.

215. The Mahaldaram Working-Circle has been made larger than Nos. 3, to 7, because the town of Kurseong and some of the tea plantations in its neighbourhood are likely to require supplies from it before long.

216. The lines between the blocks in most cases follow ridges or streams, generally the former. The Goompahar Cart-road separates the two Working-Circles on the north of the range from those on the south; whilst roads or paths have been utilized or specially made* to demarcate the areas on the tops of ranges which are set apart for special treatment. Roads or paths have as far as possible been adopted as block lines in other cases, but unfortunately these are few. The 8-inch maps submitted with this report show clearly to what extent roads and paths have been utilized as block lines. Except along public thoroughfares, like the Goompahar Cart-road and the Jorbungalow-Pashok road, the lines have been cleared and marked with rings of red paint on trees at convenient intervals: small posts, with Roman numbers cut in, being put at the extremities of the lines, and generally also where the lines cross roads or paths. All the block lines have been surveyed and carefully plotted on the 8-inch map.

CHAPTER II.

THE WORKING-PLAN.

Section I.—Detailed Description of the Forests.

217. The detailed description of the forests in each Working-Circle given in Appendix III has been drawn up from a personal examination of the forests and from Mr. Chester's description as far as it went. The areas occupied by different crops have been ascertained chiefly by eye, aided by a good field-glass. The only important difference consisted in the relative proportion of mature forest of the common type to second-growth forest, scrub or thicket. The mature forest of the ordinary type is described in the statements as 'wooded' or 'well-stocked,' and the other as 'poorly stocked.' The former is coloured on the stock-map with two tints of green, according as the forest is thin or fairly complete. The second type is shown by a yellow wash. Remnants of the old forest and scattered trees are found in this type, but their relative abundance could not be indicated. Great care was taken to prepare the stock-map as accurately as possible. Positions were taken commanding good views of the forest, and the crop was coloured on the map in the field at the time of observation. Notes were recorded when passing through the forest; and prismatic compass bearings and an intimate knowledge of land-marks enabled the writer of this report to prepare the stock-map with a close approximation. The opportunity was also taken (when surveying paths, block lines, &c., for the preparation of the 8-inch map) to note the exact position where any marked difference of crop was met with. It was afterwards found, on comparing the

* *Note.*—Only in one case was the path not made, viz., on the north of "Chattakpur Ridge." This line was pegged out, and the Divisional Officer has promised to see that it is made.

stock-map with the old map of the district, that the areas of poorly-stocked-forest coincided in almost every case with areas that had been under cultivation.

The Area Statement given in paragraph 12 shows the areas "well-stocked" and "poorly-stocked" in each block of the seven Working-Circles, and this information is repeated in the 'Detailed Description of the Forests,' as well as in 'the Statement of Fellings.'

Section II.—The Method of Treatment to be applied.

General object of management.

218. It is held that these forests must *eventually* be managed principally for the production of timber for building purposes and for tea-boxes, and, to a certain extent, for fuel and fodder. It is also necessary that pasture should be afforded under the provisions of rule 4 of the Grazing Rules (*see* Appendix IV). But the *immediate* object is to utilize the overmature crop to the best advantage.

Method of treatment.

219. As approved by the Inspector-General of Forests in his letter No. 558, dated 24th July 1890, para. 2, the forest on certain areas will be treated by the selection method. These areas have been marked off. As regards the remainder, it is proposed to effect the gradual transformation of the forest from its present irregular condition to that of graduated age-classes by means of amelioration fellings; reproduction being aided by planting in those periodic blocks which are taken in hand for regeneration. This system is very nearly the same as that proposed by Mr. Chester and approved, as regards the object, in Mr. Ribbentrop's letter No. 339, dated the 18th May 1887. The most important difference between this system and that prescribed in the Working-Plan of 1880—90 consists in the maintenance of a sheltering canopy of high forest on the areas worked and planted up. The old crop will be removed in two fellings instead of one; the planting being done in lines as before. The importance of this shelter-wood has been shown in paras. 65, 66, 89, and 90. Absolute uniformity of the crop on every acre is not to be attempted. Groups and bands of natural forest will still be left where the ground is very steep or rocky, as prescribed in the Plan of 1880—90 (see para. 106); and, similarly, plants will not be put in where there is no likelihood of their growing (see Sir D. Brandis' Suggestions, para. 58, and Dr. Schlich's Memorandum, para. 11). These are matters which common-sense would dictate to a professional forest officer, but it may be as well to allude to them.

220. On poorly-stocked areas, where lofty trees are wanting, the best shelter available will be left for the protection of the plants; even bushes and weeds will be utilized if there is nothing better. The second matter of importance regarding the method of treatment now proposed is the adoption of a series of *ad interim* amelioration-fellings in those parts of the forest which cannot be reached by the regeneration-fellings for many years. Such fellings were recommended in Mr. Ribbentrop's Note, dated the 11th December 1888. They will be made with the view of improving the condition of the existing crop; but, as grazing must be allowed, the object of management will not be to secure immediate reproduction, but rather to foster the growth of the most promising trees already on the ground at the time of the felling, so that the crop may be in the best condition possible when the time for reproduction arrives.

Reasons for adopting this Method of treatment.

221. As the method of treatment will be the same for all the Working-Circles, the reasons for its adoption will here be stated once for all.

In the first place, it appears to be the best suited to the climatic conditions noted in chapter VII. It appears to the writer that it is only by bringing the forests into a regular condition that the natural reproduction of the principal species can be assured, and the growth of weeds and the multiplication of auxiliary and inferior species be kept in check. It has been pointed out that jungle fires, though happily rare, do very great damage when they do occur, as was the case at Rangbul in 1876 (see paras. 37 and 137), *i.e.*, the part of the forest in which unregulated fellings had taken place and a thick undergrowth of weeds had invaded the soil.

The method of treatment proposed is also the outcome of experience and of the peculiar condition of these forests, regarding which a full account has been given in part I of this report, especially in chapters VIII and IX.

222. Whatever method of treatment may be adopted, the large percentage of unsound trees necessitates that the existing crop should be replaced by one of greater promise in the shortest time that it can be done without too great a sacrifice of immature trees of the kinds valued as timber. Some such sacrifice there must be in any case; but owing to the frequent unsoundness of the smaller stems, and the comparative scarcity of good timber trees amongst them (*see* paras. 50 to 56, and Appendix VIII), it will not be so real a sacrifice as might be supposed, and we believe that on the whole we have chosen the best system.

Permanent treatment by selection-fellings not generally necessary.

223. The reasons why it is not considered advisable to work the whole of the forest permanently by selection-fellings may be gathered from the facts recorded in Part I. In the first place, the *necessity* for selection-fellings exists in very few places, and in addition to the well-known drawbacks of the method, the following considerations may be stated:—The area of the forest is small, considering the needs of the district, and the production must be as great as possible. It is essential that the forests should provide pasture, and this almost entirely prevents the reproduction of the oaks, chestnuts and magnolias (*i.e.*, the most valuable timber trees), which is not satisfactory in the irregular condition of the forest which now prevails. Where it is most successful is on ridges where light is more vivid, in places where the trees are lofty and devoid of low branches, and especially where there is, moreover, no grazing; but the method of selection-fellings diminishes the height of bole and favours the development of spreading crowns, thus producing conditions suitable only for the reproduction of shade-bearing species. There is a growing demand for timber both for building and tea-boxes,* for which purposes búk and champ are most used, the former for building and the latter for building as well as for tea-chests, for which kawla is also used. Now, not only would the system of selection-fellings favour the growth of less valuable kinds, but if faithfully carried out, would yield nothing but inferior and unsound timber for several felling-rotations.

* *Note—See* paras 155, 158, 198, 199, 201.

224. As early as 1875 Mr. Gamble, who knew these forests well, recommended the treatment now advocated (*see* The *Indian Forester* for October 1875, pages 95, 96). In 1883 his views were the same, except as regards length of rotation—*See* section III, para. 229.

Coppice treatment unsuited to these forests.

225. Opinions have been cited in para. 110 to show that the coppice method of treatment, even in the lower parts of the tract, was not considered by Mr. Chester to be suitable to the circumstances in which the Darjeeling forests are placed; and additional reasons were promised in this part of the report. Without prejudice to the introduction of this method hereafter in localities where it may be found to be suitable, it may be confidently asserted that it does not appear to be so now. A complete growth of comparatively young and flourishing trees is requisite for coppice; but these forests, where complete, are in very great part composed of unsound trees which are generally too old to coppice. On the other hand, where young growth is found, it is rarely complete (except on areas worked and planted up in recent years); and there is the great difficulty, which also was noted by Mr. Gamble in the article above quoted (*loc. cit.*, page 93), " of transforming the present high forest into coppice without allowing it to get into the state of scrub which is so characteristic of the western hill slopes at 5,000 to 6,000 feet."

The forests dealt with in this report are generally of higher elevation than 6,000 feet, but still they abound with worthless soft-woods at almost all elevations. In the lower parts, where coppice has been suggested as suitable for the production of fuel for tea-estates, the oaks which are most valued as fuel, namely, búk and phalát, are extremely rare or not found at all, whilst arkhaulo is by no means common. Planters have to store their fuel for a long time in huge stacks and generally in stuffy godowns. Under these conditions the wood which is generally green and damp is very apt to decay, and the round billets, which form

the bulk of coppice wood, being generally all sapwood, are more perishable than the split wood obtained from large and middling sized trees, besides which they give a larger proportion of bark. For charcoal also large pieces are preferred; and treatment as high forest will always yield a large quantity of the fuel required, from the great number of auxiliary species not in demand as timber and from thinnings.

226. The method of coppice with standards would perhaps be advisable if there were a large agricultural population near the forests in need of small timber and fuel of the kind obtained from coppice; but there is no such population; there are no villages properly so called in the hill portion of the district, and there is little or no demand for small wood. If such a demand existed, poles would be sold in large numbers, the supply being already very great and the price extremely low. The cultivators' houses are frequently built with stone walls, poles being used only for rafters and to secure the mats with which the roof is usually covered.

The supply of dry sticks suitable for the fuel-supply of coolies on tea-estates, and of the poorer classes generally, is also ample (*see* Remarks on Fuel removed by Purchasers, chapter XI, para. 161).

227. The greatest present need is a plentiful and cheap supply of timber for construction, and also of a kind suitable for tea-boxes, for which purpose it should have the qualities of good toon wood as nearly as possible.

Fuel is also needed and consumed in large quantities both for domestic purposes and for tea manufacture. The supply of fuel, however, is ample, whilst that of timber is deficient. Sooner or later the price of coal may be so far reduced (*see* para. 187—Fuel; and para 200) as to lessen the demand for wood-fuel very considerably, in which case the produce of coppice would be so reduced in value as to be almost unsaleable. Unless, therefore, steps are taken to secure the market for firewood and charcoal, it would be unwise to adopt the coppice treatment. The demand for timber, on the other hand, is more assured. The ratio between timber and fuel, as shown by the actual outturn (*see* chapter XI), is not a just criterion of the demand, because of the state of the crop and the fact that numerous devices have been resorted to with the object of checking the sale of the best timber trees, of preventing waste of good timber and compelling the utilization of fallen wood (*see* paras. 101 to 104, 155, 158, 185, and 209). The rates for standing trees have been repeatedly raised and more stringent control exercised over the marking of trees for sale (*see* paras. 104 and 203), whilst the price of fallen wood has been successively reduced. The effect of these measures has been to stimulate the import of timber from private forests and from Sikkim. But the demand for trees from the reserved forests soon recovers (*see* paras. 158 and 209), and measures must be taken to produce more good timber, as well as to economise the existing stock. This can only be done by removing the decaying crop of forest which now cumbers the ground, so that its place may be taken by a new crop. The method proposed is calculated to effect this, and will reconcile the interests of the town of Darjeeling and those of the tea industry, whereas treatment as coppice would satisfy neither, though more in favour of the latter, since Darjeeling can be supplied with coal. (*See* para. 200 and the planters' petition referred to in para. 212.)

Rapid growth of Darjeeling.

228. A few words are necessary to show that the importance of the subject is not exaggerated. The growth of Darjeeling during the last ten years has been astonishingly rapid. The percentage of increase in the population of the municipality since the census of 1881 has been 87 per cent., probably the highest of any town in India. The importance and attractiveness of Darjeeling as a hill-station are well known. It is visited by tourists from many countries, and many Calcutta people come to Darjeeling year after year; but it is not merely a holiday resort—it is a place of education for European children and a health resort also. St. Paul's School was enlarged a year or two ago, and has nearly 150 scholars; St. Joseph's College, nearly completed, will accommodate 300* inmates; the Loretto Convent school is being rebuilt on an enlarged plan and will have room for 200 girls and small boys; the Darjeeling girls' school has accommodation for about 100 pupils, and there are other smaller schools. Besides the Eden Sanitarium for Europeans there is the large Lowis Jubilee

* The present number of boarders in the old building is 60. It is expected that the number will be raised to 100 this next year.

Sanitarium for natives; hotels and boarding-houses are being enlarged every year; the railway station has just been rebuilt and enlarged and a separate goods station added, which is already found to be too small. New barracks are to be built at Lebong to accommodate 700 to 800 men (400 Europeans and 300 to 400 natives); a darbar-hall is about to be erected and a rink is talked of. Considering all these points, the management of the Darjeeling forests may fairly be said to concern the dwellers in Calcutta and in the plains of Bengal quite as much as the population living near the forests; and it is not unreasonable that the Darjeeling forests should be managed with a due regard for the prosperity and extension of the town, as well in the interests of the tea-industry.

Section III.—The Rotation.

Opinions regarding the rotation.

220. There is no reason for adopting a different rotation in different Working-Circles, and the term chosen for all is 100 years.* Dr. Schlich mentioned 120 years as the probable rotation. Mr. Gamble also in his article on the Darjeeling forests, *loc. cit.*, gave the term of maturity of oak, magnolia, and chestnut as probably 120 to 150 years. He remarked that the term should not be too long; that 100 to 120 years would be quite sufficient. This opinion he changed afterwards, for we find recorded in the *Forest Journal* a letter of his to Mr. Chester, dated the 30th March 1883, in which he says:—

"As regards the system of working, my view is this—constitute good blocks, fix a rotation (? 150 years), and make good compartments. Cut in two fellings, a seed-cutting to take out big over-mature trees, leaving every good young one and almost all good mature ones, and when the young crop is assured, a final felling to get rid of all mature trees and most of the half-grown trees of valuable sorts. After this you will have on the ground, besides your crop of seedlings and shoots, a number of good growing trees in each compartment. No matter, leave them, *for 150 years' is a short rotation and a 200 years' tree, (oak or magnolia,) will still be in its prime when the next cutting comes round.*"

The italics are ours.

The struggle for existence.

230. It has been shown in the enumeration tables (Appendix VII) and in para. 61 that búk, champ, and katus have to contend with kawla and some other inferior species until the firstnamed reach 9½ feet in girth, when their proportion increases, and that of kawla and other species decreases. It has also been pointed out that the principal trees are most marketable when they are about 9 feet in girth or over, whilst kawla and the other auxiliary species, which are most in demand, are generally sold when they are about 8 to 9 feet in girth.

Counting of annual rings.

231. The countings made by the late Mr. F. C. Henvey on sections of a few sample trees are given in Appendix VIII. It would not have been worth while to have made extensive countings of annual rings in these forests because of the unsoundness of so much of the growing stock, the irregular condition of the forest in which the trees have grown, and the treatment to be applied. It is quite sufficient for all practical purposes to accept the data of the Manual of Indian Timbers from which the following have been taken as the average rate of growth:—

Rate of Growth.

Names of trees.	Rings per inch.	Remarks.	Names of trees.	Rings per inch.	Remarks.
Walnut	6–7		Maple, I ...	8–15	Acer Campbellii.
Tún	7–9	Growth quicker below 6,000 feet.	Maple, II ...	8–12	,, levigatum.
Pipli	6–7		Chilauni ...	10	
Champ I ...	8–12	Michelia excelsa	Gobria ...	8–10	
Champ II ...	8–9	,, *cathcartii* .	Utis	3–4	
Champ III ..	6	,, lanuginosa	Sauer	6	
Champ IV .	11	Magnolia campbellii ...	Bhadrasi ...	8	
Búk	8–12		Dubdubi	8–10	
Pi alat	8–10		Chindia	6	
K tus	8–10		Boeri ...	7	
Bara Katus	8–10		Maya ...	8–10	
Kawla	7–10		Arupati .	.	Very variable.
Pateli	10–20		Paudam ...	.	
Lepcha Kawla ...	5–9		Mowa ..	9–10	
Sisi, I	4–12	Lindera pulcherrima ..	Koolmi .	6–9	
Sisi, II ..	6	Cinamomum Tamala ...	Burkholi	10	
Tarsing	5–9		Rhododendron	20–30	
Angaria	5–15				

* Suggested by the Inspector-General of Forests in his letter 1006, dated the 31st December 1890, para. 2.

One búk tree of about 9 feet in girth examined by Mr. Henvey gave 12 rings per inch, but as búk rarely shows distinct rings, this figure must be received with caution. The examination of pieces of búk charcoal showed 8 or 9 rings per inch, so if we strike an average, the growth of búk would seem to be about the same as that of chámp, which is also the opinion formed from general observation in the forest. The 'Manual' says that the growth of búk is probably moderate; that is, 6 to 12 rings per inch.

Calculation of the length of the rotation.

232. For the present we may compute the rotation for girths of 8 feet and 9 feet at the rates of growth above assumed, thus:—

$$\text{For 8 feet girth, } 2 = \frac{8 \times 12}{2\pi} = 96 \times \cdot 16 = 15 \cdot 36.$$

$$\text{For 9 „ „ } 2 = \frac{9 \times 12}{2\pi} = 108 \times \cdot 16 = 17 \cdot 28.$$

Rate of Growth.	Rotation corresponding to.	
	8′ girth.	9′ girth.
3 rings per inch	46	52
4 „ „	61	69
5 „ „	77	86
6 „ „	92	104
7 „ „	108	121
8 „ „	123	138
9 „ „	138	156
10 „ „	154	173
11 „ „	170	190
12 „ „	185	207

The rotation chosen, namely 160 years, will probably be found a very safe one, considering the numerous species which occur in these forests, and the fact that their relative importance varies somewhat according to elevation. In the selection-fellings, and during the first rotation in the amelioration-fellings, the exploitability of trees removed will depend upon their *size*. During the second rotation, which, however, need hardly be considered now, the quick-growing trees would be removed in the thinnings. As regards búk and chámp, the *most* important species, the proportion of sapwood must be considered. Búk trees of 7 feet in girth at 4 feet from the ground have generally a ring of sapwood, 4 to 6 inches wide, *i.e.*, 51 to 70 per cent. of the sectional area at that height; and champ trees of that girth have generally a ring about 3 to 4 inches, *i.e.*, 40 to 51 per cent. of the sectional area. With a girth of 9 feet the sapwood in chámp is reduced to about $1\frac{1}{4}$ inches in width, say ·14 of sectional area; and in búk rather more, about 2 inches in width, or ·22 of sectional area at the height named. These considerations lead us to adopt as long a rotation as possible, having regard to the number and importance of the auxiliary species.

Periods into which the rotation is divided and the corresponding arrangement of fellings.

233. The rotation is divided into five periods of 32 years. It is considered advisable to adopt a long period on account of the uncertainty of the reproduction of búk. The inconvenience of a long period, due to the present condition of the crop, is to be remedied by artificial reproduction of the principal species to the extent found to be necessary, and by the application of amelioration-fellings oft

repeated in those blocks not taken up for regeneration during the first period. It is considered that the amelioration-fellings should be frequent, because so much of the stock is unsound, and unless the term is short, it will not be easy for the officer conducting the felling to decide whether the unsoundness of any given tree is so slight that the tree may await the next felling. It is proposed to adopt four years as the term, this being a submultiple of 32, the length of the period. As there are five periodic blocks in each Working-Circle, there will ordinarily be four blocks worked by amelioration-fellings, *i.e.*, one block a year; but in the Senchal, Takdah, and Nagri Working-Circles, the fifth periodic block contains either thicket, or blanks and scrub, with remnants only of the old forest. The arrangement of fellings in these cases is stated in section V.

Section IV.—Calculation of the Annual yield and area to be exploited yearly.

The basis of control.

234. The working-plan is based upon area. This seems to be the only safe course, when the general unsoundness of the crop is considered, and especially the circumstance that the younger trees are in large proportion likewise unsound (*see* paras. 50-56 and Appendix VIII). An area possibility is also more easily understood; it facilitates control and so guards against the repeated working of the same areas—a danger to which these forests are peculiarly liable owing to the undeveloped state of communications. The possibility expressed in volume would not have these advantages, and, moreover, would have been very difficult to determine and unreliable when found, owing to the decay of the trees.

Limitation of outturn of regeneration-fellings.

235. The yield of the regeneration-fellings is limited to half the crop standing on the area taken in hand, not counting the areas described as 'poorly-stocked' (*see* paras. 247 and 327).

Amelioration-fellings limited to a certain number of trees.

236. The yield of the amelioration and selection fellings is expressed by number of trees. The term tree will in this case include all stems of four feet in girth (diameter 15 inches) and above, whether standing or fallen, which are not dead; but a limit of girth is fixed for sound standing trees (*see* para. 240). The rules for selecting the trees to be removed and the numbers allowed to be cut will be found in the "Special Remarks on the Manner of Conducting the Fellings" (section V, para. 248). Suggestions have also been made in the "Detailed Description of the Forests" (Appendix III) with reference to the treatment of each block.

Expected outturn

237. An enumeration survey has been made on sample areas with the object, principally, of making a forecast of the outturn which is given in Part II, Chapter IV, and shows the material expected to be obtained under the system of working adopted.

The term for which fellings are regulated; early revision will be necessary.

238. The term for which the fellings are prescribed is sixteen years, *i.e.*, half the normal period which it is presumed will be necessary for the satisfactory regeneration of the forest on a given area. This term is chosen partly because it is the time fixed for the regeneration fellings to traverse the periodic block I of each working-circle, and also because we do not know after what interval the second or final felling should follow the first. An early revision of the present plan will be needed even on this ground alone; and in view of such revision it seems quite unnecessary to complicate the statement of fellings by prescribing anything beyond the first half-period.

Measures taken for obtaining a sustained yield

239. In order that the yield may be well sustained from one period to the next, great care has been taken in the formation and grouping of the periodic blocks, with the following result:—

Combined areas of the periodic blocks of all the working-circles.

Periodic blocks.	Well-stocked.	Poorly-stocked.	Enclosures and unproductive.	Total.	Remarks.
I	2,943	1,440	17	4,400	Includes five acres on account of nurseries and bungalow compound at Rangirun.
II	3,860	470	.....	4,330	
III	3,846	503	11	4,360	Block V of course contains much young forest (thicket) which for convenience is classed as poorly-stocked.
IV	3,755	573	2	4,330	
V	2,288	2,195	2	4,485	
Total ...	16,692	5,181	32	21,905	

The calculation of the area to be exploited annually appears in the "State ment of Fellings" in the next section, a distinction being made between areas well-stocked and poorly-stocked. The area to be taken in hand each year for the next sixteen years is also given in a separate table. It has been pointed out in para. 89 that many years elapse before blanks fill up naturally, and this is especially the case on southern and western aspects. The poorly-stocked areas must not, therefore, be left entirely uncared for. It is necessary to consider them separately now; but the distinction will disappear in course of time.

Possibility in number of trees, how fixed.

240. For determining the number of trees to be removed in the amelioration-fellings we must necessarily accept a rough computation. The following considerations have been taken into account.—

The *average crop* is estimated at 73 cords per acre of 'well-stocked' forest; say about 6,000 cubic feet, whilst in the best-stocked sample areas it has been found to be 89 cords, say 7,300 cubic feet (see forecast of outturn of Regeneration Fellings, para. 328, and Appendix VII).

The mean annual increment is unknown, and the irregular and decaying state of a large part of the crop would render any calculation of it quite as unreliable as mere conjecture, which is therefore admissible in this case. Mr. Chester put the figure at 54 cubic feet; Mr. Fernandez represented it as being nearer 80 than 54 cubic feet. Both these figures represent a low percentage on the estimated volume of the standing crop. Mr. Chester's figure is less than 1 per cent. and Mr. Fernandez less than $1\frac{1}{2}$ per cent.

Considering that the area occupied by mature crops is in excess of that which would be obtained in a forest of graduated age-classes, and that the crop is deteriorating, we shall be fully justified in removing 2 per cent. of it, provided that the unsound trees are taken in greater numbers than the sound trees. This should be done at the outset because the demand for timber is certain to increase, whilst at present a smaller proportion of sound trees will, with the timber obtainable from fallen wood and from private forests, keep the market as well supplied as it has hitherto been from reserved forests. The proportion of unsound to sound should be 75 to 25, or even more.

The average volume of the trees to be felled and the number per acre.

241. The size of the trees has next to be considered. Sir D. Brandis in 1880 ("Suggestions" para. 51) estimated the volume of trees to be cut for the fuel-supply of Darjeeling and Jalapahar as likely to be between 100 and 150 cubic feet; but this estimate included trees as small as three feet in girth, whilst the crop in the blocks of forest considered had been despoiled of all the finest trees (*See* paras. 60 and 117).

In the amelioration-fellings stems under 4 feet in girth will not be reckoned as trees *and will not as a rule be cut.* There are, moreover, many trees of *very large* size to be removed in the amelioration-fellings. Under these circumstances the size of the trees has been assumed to be 200 cubic feet in those parts of the forest which are best stocked (generally the northern and eastern slopes), whilst for the blocks in which the crop is thin the average volume is assumed to be 150 cubic feet. The proportion of large to medium sized trees during the first ten years of the period is expected to be about in the ratio of 4 to 6. If this is the case, the mean volume of a tree may be taken as 170 cubic feet. The following calculation determines the number of trees per acre to be removed:—

6,000 cubic feet, at 2 per cent=120 cubic feet.

Number of trees per acre $\frac{120 \cdot 7}{170}$, nearly.

In the special remarks on the manner of conducting the fellings (para. 246) the calculation of the number of trees is stated thus:—

		Per acre.
Unsound trees ...	1 per 2 acres	·5
Sound „	1·5 per 10 „	·15
	Total	·65

This is sufficiently near the mark, and the difference is on the safe side.

SECTION V.—ORDER AND ARRANGEMENT OF THE FELLINGS.

(*a*)—*General.*

The location of coupes.

242. The location of coupes has necessarily been left for the local Forest Officer to effect. It would have been quite impracticable to have marked permanently on the ground, especially in this hilly country, the limits of the annual coupes in advance in the seven working-circles for sixteen years, or even for eight years. The local Forest Officer should have this done one year in advance; the limits of the coupe being marked by means of rings of white paint or by marks cut on trees, or in some other simple and inexpensive manner so as to last for a few years, when the marks can be renewed if needful. A survey and plot of the coupe will of course be necessary in order to determine the area; and with the aid of the plans thus prepared and the marks on the ground, there will be little difficulty in retracing the limits of each annual coupe if required. The sylvicultural rules for the location of coupes will be observed as far as possible. In the case of regeneration fellings the first rule should always be observed, though it may be necessary in some cases to establish two series—one in the well stocked and the other in the poorly-stocked area. The amelioration and selection fellings are prescribed according to definite areas; so there is no difficulty with regard to them, except in the matter of control to ensure that the felling is extended fairly over the entire area, and that the more accessible portions are not overworked, whilst the rest is neglected. The controlling officer must see to that. There are few export paths, and therefore the second rule cannot be always observed; but as the produce is generally carried by coolies, the damage done by its extraction is not as a rule serious. If it is likely to prove so, a path should be provided and its use enforced, so as to minimise the damage.

Winds are hardly ever dangerous in these forests (*see* para 47); accordingly the third rule is unimportant.

It will not always be practicable to observe the fourth and fifth rules, owing to the necessity of taking in hand both well-stocked and poorly-stocked areas in certain proportion. As far as wind is concerned, there is no need of the fifth rule, but if practicable both these rules should be attended to. The stock map will be useful in laying out the coupes, so as to include the proper areas of well-stocked and poorly-stocked forest.

(*b*) *Special.*

243. The general working-plan, and the order and arrangement of the fellings for the first-half period are shown in the following statements. The reasons for prescribing the fellings for half a period only have been given in section IV, paragraph 238.

EASTERN RANGE.

(1)—SENCHAL WORKING CIRCLE.

Presumed Period of Regeneration of Each Periodic Block.

PERIOD.	Block.	Area in acres.
1892-93—1923-24 ...	I	1,555
1924-25—1955-56 ...	II	1,540
1956-57—1987-88 ...	III	1,690
1988-89—2019-20 ...	IV	1,600
2020-21—2051-52 ...	V	1,480
Total ...		7,865

Areas specially treated.

NAMES.	Area in acres.	Treatment.
Senchal pasture (*vide* note *infra*).	559	Selection fellings.
Bara Senchal	670	Do. do.
Total ...	1,229	

Statement of fellings for the Half-period 1892-93 *to* 1907-8.

No. of block.	LOCALITY.	AREA TO BE TAKEN IN HAND. Well stocked.	Poorly stocked.	Unproductive.	Total.	Nature of fellings.	POSSIBILITY. Well stocked.	Poorly stocked.	REMARKS.
		Acres.	Acres.	Acres.	Acres.		Acres.	Acres.	
I	Rangirun and Dawaipani.	1,209	340	6§	1,555	Regeneration.	1,039 / 16	257 / 16	*Plantation (*See* para. 134.) † Area estimated to be already worked at the end of 1891-92. ‡ Plantations (*See* para. 134.) § Bungalow Compound and Nursery. ‖ Paharpur location.
	Deduct.	170†	83*	...	253				
	BALANCE.	1,039	257	6	1,302	Average.	65	16 1/4	
II	Rishap and Rangbi.	1,540	...	...	1,540	Amelioration.	1,540	...	Cleanings to be done as prescribed under works of improvement, para. 263. 1892-93; 1896-97; 1900-1; 1904-5.
III	Rangbi and Tiger Hill.	1,570	120	...	1,690	Ditto	1,570	120	1893-94; 1897-98; 1901-2; 1905-6.
IV	Pachim, Sonada and Rangbul (part).	1,478	120	2‖	1,600	Ditto	1,478	120	1894-95; 1898-99; 1902-3; 1906-7.
V	Rangnu, Donteria, and Rangbul (part).	360	1,120	...	1,480		360	1,120	The cleanings are prescribed in para. 248 (Block V). 1895-96; 1899-1900; 1903-4; 1907-8.
	Deduct.	...	787‡	...	787	Cleanings.	...	787	
	BALANCE.	360	333	...	693	Amelioration.	360	333	

Note—This block is set aside permanently for grazing ; but the wooded portion (259 acres) will be worked by selection felling every fourth year (until the revision of the working-plan,) together with Bara Senchal (625 acres well-stocked). In the same year amelioration-fellings will be made in the well-stocked area of periodic block V ; thus :—

	Well-stocked.	Poorly-stocked.	Years of working
Senchal Pasture, S.F.	259	300	1895-96 ; 1899-1900 ; 1903-4 ; 1907-8.
Bara Senchal ,, ...	625	45*	* Omitting plantations.
Block V (part), Amelioration F.	360	333	
	1,244	678	

EASTERN RANGE.

(2)—Mahaldaram Working-Circle.

Presumed period of Regeneration of each Periodic Block.

Period.	Block.	Area in acres.
1892-93—1923-24 ...	I	710
1924-25—1955-56 ...	II	580
1956-57—1987-88 ...	III	690
1988-89—2019-20 ...	IV	725
2020-21—2051-52 ..	V	675
Total ...		3,380

Areas specially treated.

Names.	Area in acres.	Treatment.
Chattakpur ridge ...	475	Selection fellings.
Sureil	585	Do. do.
Total ..	1,060	

Statement of Fellings for the Half-period 1892-93 *to* 1907-8.

No. of block.	Locality.	Area to be taken in hand				Nature of fellings.	Possibility.		Remarks
		Well stocked.	Poorly stocked.	Unproductive.	Total.		Well stocked.	Poorly stocked.	
		Acres.	Acres	Acres	Acres.		Acres.	Acres	
I	Mamrim, S.	525	185	...	710	Regeneration.	$\{\frac{525}{16}\}$	$\{\frac{185}{16}\}$	
						Average.	$32\frac{13}{16}$	$11\frac{9}{16}$	
II	Mamrim, N.	510	70	...	580	Amelioration.	510	70	1892-93 ; 1896-97 ; 1900-1 ; 1904-5.
III	Chattakpur, N.	600	90	...	690	Ditto	600	90	1893-94 ; 1897-98 ; 1901-2 ; 1905-6
IV	,, S.	670	55	...	725	Ditto	670	55	1894-95 ; 1898-99 ; 1902-3 ; 1906-7
V	Sepoydura.	465	210*	...	675	Ditto	465	210	1895-96 ; 1899-1900 ; 1903-4 ; 1907-8.
	Total.	2,345	425	..	2,670		2,345	425	* Includes 24 acres of blanks planted, see para. 134.
S F. 1.	Chattakpur Ridge, S.	238	...	...	238	Selection fellings	238	..	The order and periodicity only of these fellings are prescribed ; their execution will depend on the demand. They will not be made in the same block more frequently than once in 8 years. If desired $\frac{1}{8}$th of the total area may be worked yearly.
S.F. 2.	Ditto, N.	237	...	..	237	Ditto	237	...	
S.F. 3.	Sureil, W.	150	50	...	200	Ditto	150	50	
S.F. 4.	Do, E.	125	260	...	385	Ditto	125	260	
	Total	750	310	.	1,060		750	310	

EASTERN RANGE.

(3)—Tukdah Working-Circle.

Presumed Period of Regeneration of each Periodic Block.

Period.	Block.	Area in acres.
1892-93—1923-24 ...	I	455
1924-25—1955-56 ...	II	465
1956-57—1987-88 ...	III	375
1988-89—2019-20 ...	IV	425
2020-21—2051-52 ...	V	480
Total ...		2,200

Statement of Fellings for the Half-period 1892-93 *to* 1907-8.

No. of block.	Locality.	Area to be taken in hand. Well stocked.	Poorly stocked.	Unproductive.	Total.	Nature of fellings.	Possibility. Well stocked.	Poorly stocked.	Remarks.
		Acres.	Acres.	Acres.	Acres.		Acres	Acres.	
I	Poomong	195	260	...	455	Regeneration	$\left\{\frac{365}{16}\right\}$	$\left\{\frac{365}{16}\right\}$	* Poomong Plantation (*See* para. 134).
V	Hoom, W.	170	310	...	480	Ditto			
	Total ...	365	570	...	935				Cleanings will be made in the planted area as prescribed in para. 277.
	Deduct ...	...	205*	...	205	Average ...	$22\frac{13}{16}$	$22\frac{13}{16}$	
	Balance ...	365	365	...	730				
II	(*a*) Hoom, E. ...	220	10	...	230	Amelioration	220	10	1892-93 ; 1896-97; 1900-1 ; 1904-5.
II	(*b*) Ditto	215	20	...	235	Ditto ...	215	20	1893-94 ; 1897-98 ; 1901-2 ; 1905-6.
III	Tukdah, W	225	150	...	375	Ditto ...	225	150	1894-95; 1898-99 ; 1902-3 ; 1906-7.
IV	Tukdah, E.	235	190	...	425	Ditto ...	235	190	1895-96; 1899-1900 ; 1903-4 ; 1907-8.
	Total ...	895	370	...	1,265		895	370	

WESTERN RANGE.

(4)—Tasiding Working-Circle.

Presumed Period of Regeneration of each Periodic Block.

Period.	Block.	Area in acres.
1892-93—1923-24 ...	I	500
1924-25—1955-56 ...	II	420
1956-57—1987-88 ...	III	400
1988-89—2019-20 ...	IV	375
2020-21—2051-52 ...	V	525
Total ...		2,220

Statement of Fellings for the Half-period 1892-93 *to* 1907-8.

No. of block.	Locality.	Area to be taken in hand. Well stocked.	Poorly stocked.	Unproductive.	Total.	Nature of fellings.	Possibility. Well stocked.	Poorly stocked.	Remarks.
		Acres.	Acres.	Acres.	Acres.		Acres.	Acres.	
I	Goom	340	160*	...	500	Regeneration	$\frac{340}{16}$	$\frac{160}{16}$	* Includes bamboo plantation. (*See* para. 134). This area is not deducted, as it must now be interplanted with buk, champ, &c.
						Average ...	$21\frac{4}{16}$	10	
II	Nai, E.	280	140	...	420	Amelioration	280	140	*
III	Nai, W.	332	68	...	400	Ditto ...	332	68	1892-93; 1896-97; 1900-1; 1904-5.
IV	Nai, S.	270	105	...	375	Ditto ...	270	105	1893-94; 1897-98; 1901-2; 1905-6.
V	Kishihat	505	20	...	525	Ditto ...	505	20	1894-95; 1898-99; 1902-3; 1906-7.
	Total	1,387	333	...	1,720		1,387	333	1895-96; 1899-1900; 1903-4; 1907-8.

WESTERN RANGE.

(5)—Posambing Working-Circle.

Presumed Period of Regeneration of each Periodic Block.

Period.	Block.	Area in Acres.
1892-93—1923-24 ...	I	305
1924-25—1955-56 ...	II	375
1956-57—1987-88 ...	III	355
1988-89—2019-20 ...	IV	355
2020-21—2051-52 ...	V	380
Total ...		1,770

Statement of fellings for the Half-period 1892-93 *to* 1907-8.

No. of Block.	Locality.	Area to be taken in hand. Well stocked.	Poorly stocked.	Unproductive.	Total.	Nature of fellings.	Possibility. Well stocked.	Poorly stocked.	Remarks.
		Acres	Acres.	Acres.	Acres.		Acres.	Acres.	
I	Balasan, W.	134	160	11	305		$\frac{134}{16}$	$\frac{160}{16}$	
						Average ...	$8\frac{6}{16}$	10	
II	Balasan, E.	275	100	...	375	Amelioration	275	100	1892-93; 1896-97; 1900-1; 1904-5.
III	Pubong, W.	310	45	...	355	Ditto ...	310	45	1893-94; 1897-98; 1901-2; 1905-6.
IV	Pubong, E.	265	90	...	355	Ditto ..	265	90	1894-95; 1898-99; 1902-3; 1906-7.
V	Tungsong	220	160†	...	380	Ditto and cleanings.*	220	160	1895-96; 1899-1900; 1903-4; 1907-8.
	Tota ...	1,070	395	...	1,465		1,070	395	† Includes Tungsong plantation, 10 acres (*see* para. 134).

* Cleanings are prescribed under the head of Works of Improvement (*see* para. 290).

WESTERN RANGE.

(6)—Mim Working-Circle.

Presumed Period of Regeneration of each Periodic Block.

Period.	Block.	Area in acres.
1892-93—1923-24 ...	I	420
1924-25—1955-56 ...	II	480
1956-57—1987-88 ...	III	360
1988-89—2019-20 ...	IV	345
2020-21—2051-52 ...	V	370
Total ...		1,975

Areas specially treated.

Names.	Area in acres.	Treatment.
Jorpokri Ridge ...	209	Selection-fellings.
Majdhura „ ...	31	Ditto.
Dungdungia „ ...	190	Ditto.
Total ...	430	

Statement of fellings for the Half-period 1892-93 *to* 1907-8.

No. of Block.	Locality.	Area to be taken in hand. Well stocked.	Poorly stocked.	Unproductive.	Total.	Nature of fellings.	Possibility. Well stocked.	Poorly stocked.	Remarks.
		Acres.	Acres.	Acres.	Acres.		Acres.	Acres.	
I	Chongtong, E. ...	310	110	...	430	Regeneration...	$\frac{310}{16}$	$\frac{110}{16}$	
						Average ...	$19\frac{6}{16}$	$6\frac{14}{16}$	
II	Chongtong, W. ..	350	130	...	480	Amelioration...	350	130	1892-93; 1896-97; 1900-1; 1904-5.
III	Parmaigiri E. ...	337	20	3	360	Ditto ...	337	20	1893-94; 1897-98; 1901-2; 1905-6.
IV	„ C. ...	332	13	...	345	Ditto .	332	13	1894-95; 1898-99; 1902-3; 1906-7.
V	W. ...	333	35	2	370	Ditto ...	333	35	1895-96; 1899-1900; 1903-4; 1907-8.
	Total ...	1,352	198	5	1,555		1,352	198	
S.F.1.	Dungdungia Ridge, E.	90	...	...	90	Selection fellings.	90	...	Felling rotation, years. 1892-93—1900-1.
S.F.2.	Dungdungia „ W.	80	20	...	100	Ditto ...	90	41	1894-95—1902-3.
	Majdhura „ ...	10	16	5	31				
S.F.3.	Jorpokri „ E.	92	15	10	117	Ditto ...	92	25	1896-97—1904-5
S.F.4.	Jorpokri „ W.	92	...	...	92	Ditto ...	92	...	1898-99—1906-7.
	Total ...	364	51	15	430		364	66	

WESTEN RANGE.

(7)—Nagri Working-Circle.

Presumed Period of Regeneration of each Periodic Block.

Period.	Block.	Area in acres.
1892-93—1923-24 ...	I	455
1924-25—1955-56 ...	II	470
1956-57—1987-88 ...	III	490
1988-89—2019-20 ...	IV	505
2020-21—2051-52 ...	V	575
Total ...		2,495

Statement of Fellings for the Half-period 1892-93 *to* 1907-8.

No. of Block.	Locality.	Area to be taken in hand. Well stocked.	Poorly stocked.	Unproductive.	Total.	Nature of fellings.	Possibility. Well stocked.	Poorly stocked.	Remarks.
		Acres.	Acres.	Acres.	Acres.		Acres.	Acres.	
I	Pagraingbong	230	225	...	455	Regeneration	465/16	565/16	
V	Palongdong, S. ...	235	340	...	575	Ditto ...			
	Total ...	465	565	...	1,030	Average ...	$29\frac{1}{16}$	$35\frac{5}{16}$	
II	Palongdong, N. ...	365	...	...	(a)365	Amelioration...	365	...	1892-93; 1896-97; 1900-1; 1904-5.
III	Rangbong, E. ...	105	...	...	(b)372	Ditto ...	362	10	1893-94; 1897-98; 1901-2; 1905-6.
		257	10	...					
IV	Rangbong, W. ...	215	...	8*	(c)368	Ditto ...	360	...	1894-95; 1898-99; 1902-3; 1906-7.
		145	...	...					
		360	...	...	(d)360	Ditto ...	360	...	1895-96; 1899-1900; 1903-4; 1907-8.
	Total ...	1,447	10	8	1,465		1,447	10	* Simanabusti location.

244. The above statements may be summarized as follows :—

Number.	Names of Working-Circles.	Regeneration fellings. Well stocked.	Poorly stocked.	Amelioration fellings and quadrennial selection fellings (Senchal Working-Circle). 1st year, 5th ,, 9th ,, 13th ,, Well stocked.	Poorly stocked.	2nd year, 6th ,, 10th ,, 14th ,, Well stocked.	Poorly stocked.	3rd year, 7th ,, 11th ,, 15th ,, Well stocked.	Poorly stocked.	4th year, 8th ,, 12th ,, 16th ,, Well stocked.	Poorly stocked.
1	Senchal	1,039	257	1,540	...	1,570	120	1,478	120	1,344	678
2	Mahaldaram	525	185	510	70	600	90	670	55	465	210
3	Tukdah	365	365	220	10	215	20	225	150	235	190
4	Tanding	340	160	290	140	332	68	270	105	505	200
5	Peambing	134	160	275	100	310	45	265	80	240	160
6	Mim	310	110	350	130	337	20	332	13	343	35
7	Nagri	465	565	365	...	362	10	360	...	360	...
		3,178/16	1,902/16	3,540	450	3,726	373	3,600	533	3,362	1,473

The selection fellings in the Mim Working Circle being arranged in an intermittent series are not included: they must be considered separately.

245. *Statement of Annual fellings in each Working-Circle.*

1—SENCHAL WORKING-CIRCLE.

Year.	Regeneration.			Amelioration.			Selection.			Remarks.
	Block No.	Area in acres.		Block No.	Area in acres.		Block No.	Area in acres.		
		Well stocked.	Poorly stocked.		Well stocked.	Poorly stocked.		Well stocked.	Poorly stocked.	
1892-93	I	65	17	II	1,540	...	...	...	...	
1893-94	I	65	16	III	1,570	120	...	...	..	
1894-95	I	65	16	IV	1,478	120	.		...	
1895-96	I	65	16	V	360	333	S.F.	884	345	
1896-97	I	65	16	II	1,540	...	.	...	...	
1897-98	I	65	16	III	1,570	120	...	...	...	
1898-99	I	65	16	IV	1,478	120		...		
1899-1900	I	65	16	V	360	333	S F.	884	345	
1900-1	I	65	16	II	1,540	...	...	...	...	
1901-2	I	65	16	III	1,570	120		...	...	
1902-3	I	65	16	IV	1,478	120	...	..	...	
1903-4	I	65	16	V	360	333	S.F.	884	345	
1904-5	I	65	16	II	1,540	...	...	...	...	
1905 6	I	65	16	III	1,570	120	..	.	...	
1906-7	I	65	16	IV	1,478	120	.	...		
1907-8	I	64	16	V	360	333	S.F.	884	345	

2—MAHALDARAM WORKING-CIRCLE.

1892-93	I	32	12	II	510	70	...*	...*	..*	* Order and periodicity only prescribed; *see* Statement of Fellings. If undertaken, these fellings might alternate with the selection fellings in the Goompahar forest (Mim Working-Circle). At present it seems doubtful whether the produce could be sold.
1893-94	I	33	11	III	600	90	...	...	...	
1894-95	I	32	12	IV	670	55	...	...	...	
1895-96	I	33	11	V	465	210	...	...	...	
1896-97	I	32	12	II	510	70	...	...	...	
1897-98	I	33	11	III	600	90	...	...	...	
1898-99	I	33	19	IV	670	55	...	...	...	
1899-1900	I	33	11	V	465	210	...	...	...	
1900-1	I	33	12	II	510	70	...	...	...	
1901-2	I	33	11	III	600	90	...	...	...	
1902-3	I	33	12	IV	670	55	...	...	...	
1903-4	I	33	11	V	465	210	...	...	..	
1904-5	I	33	12	II	510	70	...	...	...	
1905-6	I	33	11	III	600	90	...	...	...	
1906-7	I	33	12	IV	670	55	...	...	...	
1907-8	I	33	12	V	465	210	...	...	...	

3—TAKDAH WORKING-CIRCLE.

1892-93	..*	21	22	II(*a*)	220	10	...	...	...	* Regeneration will begin in Block V. Block I is practically all planted up. The remaining area poorly stocked (55 acres) will be taken in hand in 1906-8 if necessary.
1893-94	...	23	22	II(*b*)	215	20	..	...	...	
1894-95	...	21	22	III	225	150	...	...	...	
1895-96	...	23	22	IV	235	190	...	...	...	
1896-97	...	23	22	(*a*)II	220	10	...	...	...	
1897-98	...	23	22	(*b*)II	215	20	...	...	...	
1898-99	...	23	22	III	225	150	...	...	...	
1899-1900	...	23	22	IV	235	190	...	...	...	
1900-1	...	23	22	II(*a*)	220	10	...	...	...	
1901-2	...	23	22	II(*b*)	215	20	...	...	...	
1902-3	...	23	22	III	225	150	...	...	...	
1903-4	...	23	22	IV	235	190	...	...	...	
1904-5	...	23	23	II(*a*)	220	10	...	...	...	
1905-6	...	22	23	II(*b*)	215	20	...	...	...	
1906-7	...	22	27	III	225	150	...	...	...	
1907-8	...	32	28	IV	235	190	...	...	...	

4. TABIDING WORKING-CIRCLE.

1892-93	I	21	10	II	280	140	...	...	...
1893-94	I	21	10	III	332	68	...	...	...
1894-95	I	21	10	IV	270	105	...	...	..
1895-96	I	21	10	V	505	20	...	...	...
1896-97	I	21	10	II	280	140	...	...	...
1897-98	I	21	10	III	332	68	...	...	...
1898-99	I	21	10	IV	270	105	...	...	...
1899-1900	I	21	10	V	505	20	...	..	...
1900-1	I	21	10	II	280	140	...	...	..
1901-2	I	22	10	III	332	68	...	...	...
1902-3	I	21	10	IV	270	105	...	..	...
1903-4	I	22	10	V	505	20	...	...	...
1904-5	I	21	10	II	280	140	...	...	..
1905-6	I	22	10	III	332	68	...	..	..
1906-7 . ..	I	21	10	IV	270	105	...	...	..
1907-8	I	22	10	V	505	20	...	...	...

5—POSAMBING WORKING-CIRCLE.

Year.	Regeneration.			Amelioration.			Selection.			Remarks.
	Block No.	Area in acres.		Block No.	Area in acres.		Block No.	Area in acres.		
		Well stocked.	Poorly stocked.		Well stocked.	Poorly stocked.		Well stocked.	Poorly stocked.	
1892-93	I	8	10	II	275	100	...	...	...	
1893-94	I	8	10	III	310	45	...	...	...	
1894-95	I	8	10	IV	265	90	...	...	...	
1895-96	I	8	10	V	220	160	...	...	...	
1896-97	I	9	10	II	275	100	...	...	...	
1897-98	I	8	10	III	310	45	...	...	...	
1898-99	I	9	10	IV	265	90	...	...	...	
1899-1900	I	8	10	V	220	160	...	...	...	
1900-1	I	9	10	II	275	100	...	...	...	
1901-2	I	8	10	III	310	45	...	...	...	
1902-3	I	9	10	IV	265	90	...	...	...	
1903-4	I	8	10	V	220	160	...	...	...	
1904-5	I	9	10	II	275	100	...	...	...	
1905-6	I	8	10	III	310	45	...	...	...	
1906-7	I	9	10	IV	265	90	...	...	...	
1907-8	I	8	10	V	220	160	...	...	...	

6—MIM WORKING-CIRCLE.

1892-93	I	19	7	II	350	130	S.F.1	90	...	
1893-94	I	19	7	III	337	20	...	...	...	
1894-95	I	19	7	IV	332	13	S F.2	90	41	
1895-96	I	19	7	V	333	35	...	...	...	
1896-97	I	19	7	II	350	130	S.F 3	92	25	
1897-98	I	20	7	III	337	20	...	...	...	
1898-99	I	19	7	IV	332	13	S.F.4	92	...	
1899-1900	I	20	7	V	333	35	...	...	...	
1900-1	I	19	7	II	350	130	S.F.1	90	...	
1901-2	I	20	7	III	337	20	...	...	...	
1902-3	I	19	7	IV	332	13	S.F.2	90	41	
1903-4	I	20	7	V	333	35	...	...	...	
1904-5	I	19	7	II	350	130	S F.3	92	25	
1905-6	I	20	7	III	337	20	...	...	...	
1906-7	I	19	7	IV	332	13	S.F.4	92	...	
1907-8	I	20	7	V	333	35	...	...	...	

7—NAGRI WORKING-CIRCLE.

1892-93	V	30	42	(a)*	365	...	...	...	..	* Blocks II, III, and IV will be divided into four parts (a), (b), (c), (d) as shown in the Statement of Fellings for the half-period 1892-93 to 1907-8.
1893-94	V	29	43	(b)	362	10	...	...	...	
1894-95	V	30	42	(c)	360	...	...	...	...	
1895-96	V	29	43	(d)	360	...	...	...	...	
1896-97	V	30	42	(a)	365	...	...	...	...	
1897-98	V	29	43	(b)	362	10	...	...	...	
1898-99	V	29	43	(c)	360	...	...	...	...	
1899-1900	V	29	43	(d)	360	...	...	...	.	
1900-1	I	28	29	(a)	365	...	...	...	...	
1901-2	I	29	28	(b)	362	10	...	...	...	
1902-3	I	28	28	(c)	360	...	...	...	...	
1903-4	I	29	28	(d)	360	...	...	...	...	
1904-5	I	29	28	(a)	365	...	...	...	...	
1905-6	I	29	28	(b)	362	10	...	...	...	
1906-7	I	29	28	(c)	360	...	...	...	...	
1907-8	I	29	28	(d)	360	...	...	...	...	

Special Remarks on the Manner of conducting the Fellings, applicable to all the Working-Circles.

246. Whilst it is necessary to allow all reasonable latitude to the officer conducting the fellings, it is still advisable, in view of the scanty professional knowledge possessed by the executive staff generally, to insist on certain points which are considered essential to the success of the method of treatment adopted, or designed to prevent the impoverishment of the forest. The following remarks have this object. The officer making the fellings must be guided by cultural rules; but the number of trees to be removed in the amelioration and selection-fellings must be regarded as maximum until this plan is revised.

Regeneration-fellings.

247. The object is to establish a lofty canopy well distributed over the coupe to prevent exposure of the soil and afford sufficient shelter for the young growth, whilst checking as far as possible the exuberant growth of weeds. Thus the stock remaining after the felling must consist of the best and loftiest trees of the original crop whatever their species, though, other things being equal, those will be kept which it is desired to reproduce. But as reproduction of the best species of timber trees will be aided by planting,

there is not so great a necessity for seed-bearers, whilst it is desirable that the market should not be deprived of timber which is fully mature. Not more than half the stock of trees forming the upper storey may be removed in the first felling (*see* para. 327).

Where the canopy of the upper storey will afford sufficient shelter, the underwood must be cleared away with the exception of *valuable* advance growth. The advance is to be given to the most valuable species which when young have difficulty in contending with the quicker growing inferior species. Consequently such kinds as kharani, dudila, jhingni, latikat, sanupaiêli, kanakpá, phota, dabdabi, chindia, &c., should not be left where there is promise of obtaining a growth of more valuable character, though in places where there is nothing better, such kinds must be used to shelter the plants, and their subsequent suppression will be effected by cleanings.

The planting works to be carried out in connection with the regeneration-fellings are described below under the head of works of improvement; *see* section VII (*iii*).

Amelioration-fellings.

248. The following remarks are generally applicable, except in the case of the areas in the Senchal Working-Circle to be permanently worked by selection-fellings, but which will be temporarily taken in conjunction with the wooded portion of Block V of that working-circle. Remarks special to each circle are recorded in the detailed description of the forests (Appendix III).

The principal object of these fellings is (by the removal of the unsound trees, and the conservation of those which are sound or nearly so) to make the existing crop last out until the time arrives for regeneration; it is also desired to improve, as far as may be, the composition of the crop, *i.e.*, to increase the proportion of the valuable kinds; and, thirdly, to enrich the crop in order that, as the time of regeneration nearly approaches, the canopy may be as complete and lofty as possible, and the surface of the soil comparatively free from weeds. To effect all this it is essential that the officer conducting the felling should bear in mind the presumed period of regeneration, *i.e.*, the number of the Block in which he is working, thus:—

BLOCK II.

(1) Interval to elapse before regeneration, 32 to 64 years.

(2) The following to be removed in amelioration-fellings:—

(*a*) All dead wood.

(*b*) Hollow, badly broken, or fallen trees, at a rate not exceeding 1 per 2 acres of well-stocked area, including those accidentally broken during the felling operations.

(*c*) Sound trees of 9 feet girth of low crown and defective growth, not exceeding in number 1·5 trees per 10 acres of well-stocked area and providing that their removal is justified sylviculturally.

If sound trees are not available, the number may be made up by unsound trees.

(3) Where the crop is for the most part immature, case (2) (*c*) may be extended to trees of 8 feet in girth and over where the interests of the surrounding trees demand it.

(4) Suppressed and badly-grown saplings and small poles of good species which are known to coppice should be cut back if the conditions are favourable for new growth, but generally the underwood must be maintained as dense as possible in order to keep the ground free from weeds.

(5) Of the sound trees obtained under (2) (*c*) and (3), the proportion of the species shall be as follows:—

Tún, walnut, pipli, magnolia, oaks, and chestnuts taken together not more than 70 per cent.

BLOCK III.

(1) Period to elapse before regeneration, 64-96 years.
(2) The following to be removed during the first period:—
(*a*) As before.
(*b*) As before.
(*c*) According to the composition of the stock:—
(*i*) Where the crop is mostly mature high timber forest—Mature trees 9 feet in girth and over, not exceeding 1·5 per 10 acres of well-stocked area, first taking those of defective growth and low crowns.
(*ii*) Where the stock is mostly immature—Trees of 8 feet girth and over may be removed at the same rate as under (*i*), where it is necessary to free promising young growth.
(*iii*) Where the stock contains no big trees—Thinnings should be made where necessary.

(3) In above cases where sound trees are removed, the proportion must be as prescribed for Block II.

BLOCK IV.

(1) Period to elapse before regeneration, 96-128 years.
(2) The following to be removed during the first period:—
(*a*) As before.
(*b*) As before.
(*c*) According to the composition of the stock:—
(*i*) Provided that the stock of young growth, aged 32-64 years, (say 3-6 feet girth) is sufficiently complete, all the older trees may be removed during the first period.
To effect this, one-eighth of the number will be removed in each successive felling.
(*ii*) If no big trees exist, thinnings will be made where required.
(3) The proportion in which the timber trees are taken yearly will be as nearly as possible that prescribed for Blocks II and III. All the oaks, champs, and other valuable trees may not be cut out first, leaving only inferior species for the future.

BLOCK V.

(1) Should normally contain trees from 1 to 32 years. Period of regeneration after 128 to 160 years.
(2) The following to be removed during the first period:—
(*i*) Case in which young forest covers the ground as in Dooteria Block.
Cleanings and early thinnings together with removal of all large trees where there is no advantage in retaining them.
(*ii*) Where extensive blanks occur with patches of old forest, working as in Block I in the cases specially provided for in the Statement of Fellings.
(*iii*) Where the ground is uniformly covered with forest of the usual type, working as in Block II, case (2)—(*a*), (*b*), (*c*).

SELECTION FELLINGS.

The fellings may remove at the most:—
(*a*) All dead wood.
(*b*) Hollow and badly broken, standing, and fallen trees, not dead, at a rate not exceeding 1 tree per 5 acres of well-stocked area, irrespective of size.
(*c*) Sound trees of 8 feet in girth or over, 1 tree per 15 acres, or if the felling of sound trees is not advisable, the number may be made up by trees as per case (*b*).

Forecast of the condition of the crop at the end of the first half-period.

249. In the blocks taken up for regeneration during the 1st period the first fellings will have passed over the whole area which will also have been planted up. The plantations will range from 16 years (the earliest planted) to 1 year. It is anticipated that a revision of the plan will take place after 8 or 10 years, and that final fellings may then be commenced. The blocks worked by amelioration and selection fellings will still be irregular, but will contain a larger proportion of sound and well-grown trees with well-formed and lofty crowns.

The young growth now in the state of thicket will have passed into that of saplings or young poles, and the necessary cleanings to be made during the first sixteen years of the period should have set free a considerable number of promising saplings of good kinds.

SECTION VI.—DISPOSAL OF THE PRODUCE.

The agency of exploitation to be employed.

250. The facts and opinions set forth in part I, paras. 121 and 127 to 132, and a comparison of the net revenue derived from produce removed by Government agency and by purchasers (*see* para. 209) show conclusively that the latter is the most profitable mode of sale. The increase in the outturn removed by purchasers, moreover, shows that this system is capable of development. The new schedule of rates and conditions of sale (see Appendix VI) have accordingly been drawn up in furtherance of these views.

But it is not desirable to lay down any hard-and-fast rule. Cases may occur in which purchasers are not forthcoming to remove the produce of a felling which it is imperative should be made: for example, in the case of the material cut on poorly-stocked areas in course of regeneration or of a crop seriously damaged by fire or otherwise. In such a case it may be necessary to cut and convert the material by Government agency, and if it cannot then be disposed of on the spot, it must be considered whether it should be abandoned or collected either in a forest depôt until a market can be found for it, or be taken at once to a sale depôt. Another instance may be given in which it may be necessary that Government agency should intervene, and that is in the case of cleanings and early thinnings, because in young growth control is difficult, and it is desirable not only to have a hold on the workmen, but to have the operations carried out immediately in the presence of the officer entrusted with their execution. The produce of such operations may in some cases not be saleable, but will generally be so, because the blocks (Rangbul and Dooteria) where they are most needed during the next few years are close to the Jor bungalow, Jalapahar and Darjeeling markets, and the produce can probably be sold *in situ*.

251. The supply of the Commissariat Department will be managed by Government agency as before; but the Forest Department will gradually withdraw from the sale of timber and fuel in the station of Darjeeling, and steps have already been taken in this direction. Measures must now be devised to facilitate the sale of the material in the forest, either standing or converted, and the arrangements to effect this should be made in the light of the remarks contained in paras. 121,122. It is especially necessary, in view of the difficulties of export, that the option should be allowed to the purchaser to make charcoal. The foregoing remarks apply principally to timber and fuel. Only under exceptional cases are bamboos, fodder, and minor produce exported by Government agency, and such will continue to be the practice.

Bamboos are now rarely sold for matmaking in the forests to which this report relates, as they are cut principally for fodder; but the system of selling by auction the right of cutting bamboos for this purpose, which was formerly in force, worked well (see para. 162), and might perhaps be advantageously introduced in the Singalilá forest. The same system might be adopted in the case of valuable articles of minor produce, such as chiretta, manjit, wax, honey, and other commodities which are not necessaries, and in respect of which there would be no harm in selling the monopoly of collection for one or two seasons; otherwise the system of sale on permit may be continued with such modifications as may be approved from time to time. It is hardly necessary to say that dead wood should be sold wherever there is a demand for it, and efficient control over its removal can be exercised.

252. The conditions regulating grazing in these forests have been adverted to in paras. 133 and 141. For Grazing Rules, *see* Appendix IV. In accordance with the orders of Government contained in Revenue Department (Forests) letter No. $\frac{1835}{266}$, dated the 16th May 1890, to the address of the Conservator of Forests, Bengal, the new arrangements for grazing necessitated by the plan of working recommended in this report have been made in communication with the Deputy Commissioner of Darjeeling, and have been approved by him and by the Commissioner,* subject to the condition that the graziers required to move their bathans shall be compensated for the expense of removal. The divisional officer has been desired to assess the cost of removal in each case, and to report when the estimate will be submitted for sanction.

Grazing Management.

* Deputy Commissioner's letter No 846G, dated Darjeeling, the 6th October 1891, to the address of the Commissioner of the Rajshahi Division; and the Commissioner's letter No. 815, Ret, dated the 6th November 1891, to the address of the Deputy Commissioner of Darjeeling.

The new arrangement necessitates the removal of nine bathans only,—all in the Goompahar Forest, viz., Nos. 24, 26, 28, 30, 31, 32, 37, 41, and 45.

There are 47 graziers who keep their cattle in the forests—22 in the tract east of Jorbungalow and 25 in the Goompahar Forest. There are also five men who graze in all 44 head of cart cattle in the Mahaldaram Forest, but have their batháns outside. Mr. Nicholson of Jorbungalow grazes 4 animals in the Senchal pasture block, but has no bathán. In some cases two graziers occupy one bathán, whilst a few men have more than one. The position of each bathán has been ascertained by survey, and is shown on the (2″ and 8″) maps. The numbering of the batháns may be explained by the following example:—

(2) Signifies that the bathán belongs to grazier No. 2 (Buxoo), and that the cattle are kept there throughout the year.
(2*a*) Signifies that the bathán is used by Buxoo from 1st April to 31st October.
(2*b*) Signifies that the bathán is used by Buxoo from 1st November to 31st March.

The arrangements made for grazing are stated below, and it is understood that they are liable to revision after 10 years or so, when the revision of the present plan is undertaken. In view of the rapidly increasing population of Darjeeling and of the military station, it would be futile to attempt to make provision now for the requirements of these places in the matter of grazing for the whole period of 32 years; but as far as can now be foreseen, it will not be necessary to alter the present arrangement *of areas* for fully 20 years. It may then be desirable to close part or the whole of Block II in each Working-Circle for the remaining twelve years of the period, in order to prepare for regeneration:—

253. *Statement showing areas open to grazing in the Estern Tract.*

Block.	Area.	Remarks.
Senchal Forest.	Acres.	
Senchal Pasture	559	
Bara Senchal	670	
Senchal Block, II (part N. of Rangbi R)	644*	* Approximate area.
„ Block III	1,690	
„ Block IV	1,543†	† Omitting Rinchingtongdhara and Paharpur location.
Total Senchal Forest ...	5,106	
Mahaldaram Forest.		
Mahaldaram, Block III . .	690	
„ Block IV (part below and west of old military road)	565	
Mahaldaram, Block II (part south of Sureil road).	351	
Total Mahaldaram Forest ...	1,596	
Tukdah Forest.		
Tukdah, Blocks II, III and IV ...	1,265	
Total area open to grazing in the Eastern Tract.	7,967	

The area open to grazing in this tract under the previous arrangement, sanctioned by Government order No. 511 T. R., dated 2nd October 1882, was 6,085 acres. There is therefore an increase of 1,882 acres. It was intended to close the Bara Senchal block, which will be worked by selection-fellings and also supplies fodder (maling bamboo) for Darjeeling. But in deference to the Deputy Commissioner's wishes, the block has been declared open to grazing, though it is not likely to be much resorted to owing to its rather high elevation.

The number of cattle admissible under rule 3 of the Grazing Rules to pasture in the above-mentioned tract would be as follows .—

Blocks.	Area.	Number of cattle admissible		Remarks.
		@ 10 acres per head.	@ 5 acres per head.	
Senchal Working-Circle.	Acres.			
Senchal Pasture ...	559	56	112	
Bara Senchal ...	670	67	134	
Block II(part) & Block III	2,334	233	467	
Block IV * ..	1,543	154	308	*Rinchingtongdhara not included.
Total, Senchal Working-Circle ...	5,106	510	1,021	
Mahaldaram Working-Circle ...	1,596	160	320	
Tukdah Working-Circle	1,265	127	253	
Total Eastern Tract	7,967	797	1,594	

The number of cattle admitted to graze, and the average area per head vary with the season; thus a registered grazier is allowed to keep throughout the year a certain number of cows with their calves; but on the expiry of twelve months without a conviction under the Forest Act, he is allowed to increase the number by one-third from the 1st April to the 31st October, *i.e.*, during the Darjeeling season. The maximum and minimum numbers for the Eastern Tract are as follows :—

	Minimum.	Maximum.
Number of cattle registered	167	211
Average area (in acres) per head	47·7	37·7

These figures show that the grazing is very light on the whole; but it is concentrated somewhat in the Rangjo Block (III of Senchal Working-Circle).

Account must, moreover, be taken of the steepness of the ground in some parts, and the scantiness of pasture in others. The want of paths prevents the cattle being driven to any great distance from the bathans. The graziers themselves insist on these points, but still it is evident that the number of cattle may be increased (especially when paths have been made) without otherwise altering the present settlement.

254. *Statement showing areas open to grazing in the Western Tract.*

(Goompahar Forest.)

Blocks.	Area.	Remarks.
	Acres.	
Nai and Rishihat } Blocks II, III, IV, V of Tasiding Working-Circle.	1,720	
Balasan (part) Pubong (part) } Blocks II and III of Posambing Working-Circle.	730	
Chongtong (part) Parmaigiri (part) } Blocks II, III, IV, V of Mim Working-Circle.	1,550	
Pagraingbong (part) Palongdong (part) Rungbong ... } Blocks II, III, IV of Nagri Working-Circle.	1,457	
Total ...	5,457	

The area open to grazing in this forest under the previous arrangement was 5,312 acres. Increase 145 acres.

The number of cattle admissible under rule 3 of the Grazing Rules to pasture in the area now open would be —

Blocks.	Area in acres.	Number of cattle admissible		Remarks.
		At 10 acres per head.	At 5 acres per head.	
Nai and Rishihat ...	1,720	172	344	
Part of Balasan and Pubong	730	73	146	
„ Chongtong and Parmaigiri ...	1,550	155	310	
Part of Pagraingbong ... „ Palongodng and Rangbong ...	1,457	146	291	
Total ...	5,457	646	1,091	

The maximum and minimum numbers for the Goompahar forest are as follows :—

	Minimum.	Maximum.
Number of cattle registered	140	184
Average per head—Acres	39	29·7

SECTION VII —WORKS OF IMPROVEMENT (SPECIAL).

255. The works included under this head are those connected with sylvicultural treatment, and in these forests comprise :—

(*i*) Cutting of climbers.
(*ii*) Clearance of the ground under a regeneration felling, and dibbling in acorns to assist natural reproduction.
(*iii*) Planting of the annual regeneration coupes, including nurseries.
(*iv* Cleanings and early thinnings.
(*v*) Fencing.

(1)—Senchal Working-Circle.

(*i*)—*Cutting of Climbers.*

256. The Divisional officer requires the forest guards to do this work on their daily rounds, and the Range Officer has to submit a monthly return of creepers cut. It will, however, be an advantage to do the work more thoroughly and methodically. The guards may still be required to take a part in it,* with the assistance, perhaps, of a few coolies; but the monthly return may with advantage be dispensed with. There will be no need for it if certain areas are taken in hand in succession, so that the Divisional officer can judge by inspection whether the work has been adequately performed. Climbers should be cut a full year in advance of the fellings, and, as far as possible, before the ripening of the seeds of the most troublesome climbers, as it is manifestly less advantageous to cut them after their seed has fallen. The interval or rotation should not be too long, or the labour of cutting as well as the mischief will be increased.

It is considered that four years will be a suitable term. Blocks taken in hand for regeneration during the first period will be treated separately. Climbers will be cut over the whole block every fourth year, and specially over each annual coupe in the year before the felling; omitting, of course, those years when the whole block is gone over.† The remaining areas may then correspond with

* Note.—The cutting of climbers on the area to be taken up as the next year's coupe (the 'special' area of Block 1) may certainly be done by the guard.

† Note.—This arrangement will require provision to be made for the cost of cutting climbers over a larger area every fourth year, viz. 9,428 acres in 1895 96, 1899-1900, 1903-04, 1907-08, &c. In other years the area for the entire tract will range from 4,393 to 5,460 acres. It is held that the advantage of the proposed arrangement outweighs the inconvenience.

those worked by amelioration-fellings, and the table showing their rotation will be as follows for the first half-period :—

Designation of Areas.	Acres.	Years of cutting.				Remarks.
Block I, the whole	1,549*	1895-96	1899-1900	1903-4	1907-8	*Excluding bungalow compound and nurseries.
,, Special† ..	...	1892-93 1897-98	1893-94 1898-99	1894-95 1900-1	1896-97 &c.	†Over the coupe of next year.
Block II	1,540	..	1895-96	1899-1900	1903-4	Also in 1907-8.
Block III	1,690	1892-93	1896-97	1900-1	1904-5	
Block IV	1,596‡	1893-94	1897-98	1901-2	1905-6	‡Excluding Paharpur location.
Block V	1,480	1894-95	1898-99	1902-3	1906-7	§Excluding blank area of Senchal Pasture.
Bare Senchal, Senchal Pasture	939§					

(ii)—Clearance of the ground under a regeneration of felling.

257. Until the revision of the Working-Plan, the experiment will be made on an area of 2 to 5 acres in each annual coupe of clearing the ground of all weeds and worthless undergrowth, including saplings of inferior kinds, with the object of assisting natural reproduction generally, and especially to ascertain whether this operation will secure the natural reproduction of oaks and chestnuts in a satisfactory degree and at reasonable cost. The clearing will be effected in the year previous to felling, in order that the condition of the plot at the time the felling is made may not be disguised by recent clearing. It should be done in the month of October or November, about the time when the fruit of the oaks, chestnuts, and magnolias ripens. Mr. Gamble, in his article in the *Indian Forester loc. cit.*, page 96, recommended this measure in 1875. He says—It seems that the seeds do not "germinate until they reach the soil below the mossy covering."

Block I of this Circle is the best adapted for the experiment which will be established under favourable conditions as regards seed-bearers; and the other conditions affecting the experiment will be noted and recorded, such as soil, aspect, character of the crop, the degree of canopy, and whether it is low or lofty, etc.; the cost will also be recorded annually, in order that it may soon be decided whether under certain conditions the expense of the planting may not be saved.

258. The dibbling in of the acorns will also be tried on a separate part of the annual coupe in order to ascertain whether the scantiness of reproduction of the oaks may be accounted for by the acorns not being readily embedded in the soil. A sum of Rs. 5 will be allotted yearly for this work, and a careful record will be kept of the results obtained. A hole about a foot deep should be made with the dibble and be nearly filled with crumbled leaf-mould, one or two acorns being then put in and covered about 1 inch deep with light soil. This experiment is suggested by paragraph 44 of Mr. Chester's working-plan; but as an experiment the operation should be more carefully conducted. A few thousand acorns should be dibbled in lines, the places being marked by stakes. Countings will be made to test the success of the experiments, and the result will be recorded in the *Forest Journal.*

(iii)—Planting of the Annual Regeneration Coupes.

259. The areas to be planted are those entered in the Statement of Fellings, and comprise about 65 acres of well-stocked and about 16 acres of poorly-stocked forest annually for the first half-period. There is, however, no objection if funds and plants are available to the poorly-stocked areas being planted up at a quicker rate.

The areas entered as well-stocked will be planted the year after the felling in lines about 20 feet apart, under the shelter of the trees left standing on the coupe, as noted in paras. 219 and 247. The plants will be 6 feet apart in the lines, except that spots unfavorable for planting will be passed over, and that the planting of rocky and very steep slopes will not be attempted. The original forest will be left in such places, where the working will have the character of selection-fellings.

260. There are no reliable statistics of the cost of planting under this system. The following estimate is therefore given :—

Estimated cost of planting in Regeneration coupes.

Particulars.	Cost per square of 100 acres (side 2,087 feet).
	Rs.
Clearing lines, 41¼ miles, @ Rs. 3-12 a mile ...	154·7
Digging pits, 36,300 @ As. 8 per 100	186·5
Planting, including lifting plants from nursery, @ As. 8 per 100	186·5
Cost of labour ...	527·7
Cost of plants, say 37,000* 2 or 3 years old in nursery, about Rs. 4-8 per thousand ...	166 8
Cost of clearing lines twice during 1st year, twice in the 2nd year, and once in the 3rd, 4th, and 5th years, say, 288¾ miles, @ Rs. 4 per mile	1,155·0
Total ...	1,849·5

* Allowing for damaged plants.

Cost per acre about Rs. 18-8.

This does not, however, allow for filling up vacancies nor fencing. As continuous lines must be cleared, there would be but slight saving in putting the plants far apart in the lines, whilst by planting closely the necessity of filling up vacancies should rarely occur, and the plants may be readily found when cleanings are required. Vacancies should not be planted up except in places where the failures exceed fifty per cent., and even in that case it must be considered whether success is likely to be attained by again planting the same species, or whether more hardy kinds should not be employed.

Poorly-stocked areas.

261. These must be planted up in regular order as noted in para. 242. Hardy kinds of trees should be used for planting up grassy blanks where shelter is deficient; and it may be necessary in some very exposed situations to hoe up the turf-covered soil in contour bands at a certain distance apart, and to sow these bands with the seed of plants common in second-growth forest in the locality, or to plant them with maling bamboo, &c. The close planting of cryptomeria pure or with pipli should be adopted where the blanks are extensive, where cattle-trespass is troublesome and especially where a demand for tea-box timber is likely to arise. A certain number of tún and walnut should also be introduced in localities specially suited to them, *e.g.*, in rich light soil, at warm aspects, and in sheltered situations.

Nurseries.

262. Measures have been taken to establish or extend the nurseries and to stock them sufficiently. The principal nursery of the Senchal Working-Circle is at Rangirun about the middle of Block I. It occupies about 1½ acres of ground and can be irrigated. It must be fully stocked every year.

Species of plants to be raised.—It has been noted in paras. 66, 108, and 111 that for planting in jungle plants two to three years old are as a rule preferable, especially if they grow slowly when young. It has been observed that seed

of búk, chestnut, and magnolia is not obtainable every year; that at the lowest elevations they are not the principal species; and that certain kinds, such as alder, birch, and pipli are suitable for planting in special situations. It has also been remarked that hardy kinds must sometimes be employed for stocking blanks to act as nurses to more valuable trees to be planted afterwards. Tún, walnut, cryptomeria, mohwa, and other fast-growing trees, the timber of which is suitable for tea-boxes have been recommended for planting in the neighbourhood of tea estates.

The following list of species that may be usefully raised in nurseries has accordingly been drawn up:—

Species.	No. of years in nursery.	Elevation.
* Búk	3	Above 6,000 feet.
* Phalat		At all elevations (different varieties).
* Katus		Above 6,000 feet.
* Singori Katus ...		„ 7,000 „
* Champ		Species sutable at different elevations.
* Cryptomeria .		Below 8,000 feet.
* Pipli	2	„ 7,500 „
* Walnut		At all elevations.
Gobria ...		Below 6,500 feet.
Tarsing		„ „ „
Kawla		At all elevations.
Burkholi		Below 6,500 feet.
Arupati		At all elevations.
Mohwa		Below 6,000 feet.
Birch	1	„ 7,000 „
Lepcha kawla ...		„ 6,500 „
Utis		„ 7,000 „
* Tún		„ 6,500 „

The asterisks indicate the species which will be required in the greatest numbers. In the event of seed of any desirable kind being unprocurable, the next best obtainable will be collected in larger quantity to make up the deficiency.

The nurseries will contain the produce of four years' sowings, thus:—

(1) Seed freshly sown.
(2) Seedlings pricked out.
(3) 2nd-year transplants.
(4) 3rd „ „

The seedlings pricked out should be not less than 6 inches apart, and those which are to remain in the nursery for three years should be fully 9 inches apart. The nursery should yield at least 50,000 plants annually, and the cost is estimated thus:—

	Per annum.
2 Malis, at Rs. 8	192
Collecting seeds, say	20
Labour of weeding and pricking out	15
	227

Cost per thousand plants $\frac{227}{50}$ =Rs. 4·54, say Rs. 4-8.

(*iv*)—*Cleanings and early thinnings.*

263. As these operations are very often neglected when their execution is not prescribed, and plantations which have cost much money are thereby ruined, it seems advisable to explain where they are needed in existing

plantations and to indicate a suitable rotation of areas for their execution. The following is the list:—

Locality.	Area.	Remarks.
	Acres.	
Block V.—Plantations in—		
Acres.		
Rangbul ... 281		
Dooteria ... 367 }	787	Cleanings much needed.
Rangnu ... 139		
Block I—The older Rangirum Plantation	83	Ditto.
Block I—Coupes of 1889-91 ...	75½	Recently planted. Cleanings are done annually.
Total ...	945½	

To avoid multiplying the operations and corresponding tables, the cleanings will be synchronous with the cutting of climbers over entire periodic blocks; *see* table in sub-section (i), para. 256 above. As the cleanings will be something more than climber-cutting, the work will be entrusted to a special agency (*see* para. 319); and if it is found that cleanings are not needed every fourth year, they can be done at every alternate recurrence of climber-cutting. Annual cleanings will be continued as long as they may be necessary in the coupes of 1889—91 and in those of future years in Block I; but a longer interval will be adopted as soon as it safely may be, and the table will be given in the annual plan of operations from year to year.

(*v*)—*Fencing.*

264. It is not expected that there will be any necessity to fence the plantations in Block I; but those in Block V (Rangbul and Dooteria) must be fenced in those places where cattle are apt to stray in. Other measures must also be taken to prevent deliberate cattle-trespass.

(2)—Mahaldaram Working-Circle.

(*i*)—*Cutting of climbers.*

265. General remarks the same as for Senchal Circle.

Table.

Description of Areas.	Acres.	Years of cutting.				Remarks.
Block I—the whole ...	710	1895-96	1899-1900	1903-4	1907-8	
Ditto—special.*	...	1892-93 to 18 7-98	1893-94 to 1898-99	1894-95 to 1900-1	1896-97 &c.	*Over the coupe of the next year.
Block II †	580	...	1895-96	1899-1900	1903-4	† Also in 1907-8.
Block III	660	1892-93	1896-97	1900-1	1904-5	
Block IV	725	1893-94	1897-98	1901-2	1905-6	
Block V ...	675	1894-95	1898-99	1902-3	1906-7	
S. F. 1 ..	236					
S. F. 2 ..	237					
S. F. 3 ..	200	..	...	...	...	Climbers need not be cut unless these areas are worked, and then should precede the fellings by one year.
S. F. 4	395					

(ii)—Clearance of the ground under a regeneration-felling and dibbling in acorns.

266. Nil.

(iii)—Planting of the annual regeneration coupes.

267. The areas to be taken in hand annually in Block I are—

Well-stocked area	...	About	33 acres.
Poorly-stocked „	...	Not less than	12 „

(*See* Statement of Fellings.)

The general remarks under this head are the same as for Senchal Circle.

268. *Nurseries.*—The plants will be obtained from the Sepoydhura nursery (area about ½ acre) which is near the Forester's head-quarters. If this is found to be too far, a new nursery will be made in Block I. About 17,000 plants will be planted out yearly, but it will be safer to raise 20,000 to 25,000 plants on account of the irregularity in the supply of oak seed, and to allow for loss through carrying to a distance. The close planting of small blanks and glades will also perhaps be advisable, in which case 25,000 plants per annum will not be too much.

269. *Species of plants to be raised.*—The general remarks on this subject regarding Senchal Working-Circle apply here also; but chestnut, búk, and champ should chiefly be planted in the upper part of Block I., and walnut, tún, pipli, and phalát in the lower part; that is to say, the most valuable timber trees should be grown in this block, which is somewhat handicapped by the difficulties and expense of transport.

(iv)—Cleanings and early thinnings.

270. The blanks planted up in this circle are generally small and scattered; cleanings are hardly called for; all that is necessary can be done when climbers are cut and amelioration-fellings made. The plantations to be made in Block I will be cleaned twice during the first two years, and once a year afterwards so long as may be necessary. Anything beyond this may await the revision of the Working-plan.

(v)—Fencing.

271. Fencing should be undertaken if necessary to keep cattle out of areas planted.

(3)—TAKDAH WORKING-CIRCLE.

(i)—Cutting of climbers.

272. General remarks as before.

TABLE.

Description of areas.	Acres.	Years of cutting.				Remarks.
Blocks, V and I.—The whole *	935	1892-93†	1895-96	1899-1900	1903-4	* And in 1907-8.
„ „ Special ‡	...	.....	1893-94	1894-95	1898-97	† As a special case, to be accompanied by cleaning.
	...	1897-98	1898-99	1900-1	&c.	
Block II (a) §	230	.. ..	1895-96	1899-1900	1903-4	‡ Over the coupe of the next year.
Ditto (b)	235	1892-93	1896-97	1900-1	1904-5	§ And in 1907-8.
Block III	375	1893-94	1897-98	1901-2	1905-6	
Block IV	425	1894-95	1898-99	1902-3	1906-7	

(ii)—Clearance of the ground under a regeneration-felling and dibbling in of acorns.

273. Nil.

(iii)—Planting of the annual regeneration coupes.

274. The areas to be taken in hand annually in Blocks V and I are—

Well-stocked area		16 acres	
Poorly-stocked not less than	...	16 „	almost entirely in Block V.

(*See* Statement of Fellings.)

General remarks the same as for Senchal Circle.

275. *Nurseries.*—The Poomong nursery (area one acre nearly) is well situated and capable of irrigation. In this moist climate with ordinary precautions plants can safely be carried during the rains to a considerable distance from the nursery to the site of the plantation; but if found inconvenient or too expensive, a new nursery will be made about the middle of Block V.

The maximum number of plants needed annually may be estimated, thus:—

16 acres planted in lines, @ 370 plants per acre, say	...	6,000
16 acres planted with cryptomeria, about 5′ × 5′, @ 1,750 plants per acre, say	...	30,000
		36,000

276. *Species of plants to be raised.*—The greater part of the area to be planted is situated below 6,000 feet, and is most advantageously placed for the supply of timber to the tea estates on the Gielle spur. The larger proportion of the plants should therefore be of kinds suitable for tea-box wood, *e.g.*, tún, cryptomeria, walnut, pipli, utis, mahua, tarsing, &c., whilst champ, chestnut, búk, and phalat should also be planted in the upper part of the area. The close planting of cryptomeria should be tried in the Mallota forest so common in this area, and if the growth is satisfactory it should be done extensively. It is not necessary that the plants should be exactly 5′×5′, but should be about that distance apart. Close planting is necessary in order that the timber may be free from knots, which would render it unfit for tea-boxes.

(*iv*)—*Cleanings and early thinnings.*

277. In the Poomong Block (I) the area planted up is much in need of these operations, the plants having been put in dense scrub growth in some parts and in the thick underwood of high forest in others. Cleanings must therefore be early attended to, and in some parts will have the character of early thinnings. The order and arrangement of these operations will be the same as that prescribed for climber cutting (except the special areas in Blocks V and I).

(*v*)—*Fencing.*

278. This will be done if necessary along the block lines adjoining blocks II of Tukdah Circle and III of Senchal Circle, which are open to grazing.

(4)—TASIDING WORKING-CIRCLE.

(*i*)—*Cutting of climbers.*

279. For general remarks see Senchal Working-Circle.

TABLE.

Description of areas.	Acres.	Years of cutting.				Remarks.
Block I.—The whole...	500	1895-96	1899-1900	1903-4	1907-8	
„ Special	.....	1893-94 1898-99	1894-95 1900-1	1896-97 &c.	1897-98	Annual coupe one year in advance of regeneration-fellings.
Block II*	420	.....	1895-96	1899-1900	1903-4	* Also in 1907-8.
Block III	400	1892-93	1896-97	1900-1	1904-5	
Block IV	375	1893-94	1897-98	1901-2	1905-6	
Block V	525	1894-95	1898-99	1902-3	1906-7	

(*ii*)—*Clearance of the ground under a regeneration-felling and dibbling in of acorns.*

280. Nil.

(*iii*)—*Planting of the annual regeneration coupes.*

281. The areas to be taken in hand in Block 1 are—

Well-stocked area ... About 21 acres.
* Poorly-stocked „ ... Not less than 10 „

(*See* Statement of Fellings.)

* (Including area planted with maling bamboo).

282. *Nurseries.*—The plants will be supplied from the Goompahar nursery (area $\frac{3}{4}$ acre), which will be extended if necessary. The number of plants required annually will be—

For 21 acres, well stocked, about	...	...	8,000 plants.
For 10 „ poorly stocked, to be planted (10′ × 10′)	...	...	5,000 „
	Total	...	13,000

283. *Species of plants to be raised.*—The situation of the block close to Darjeeling indicates that the species most valuable as building timber and for general use should be employed, viz., oaks, chestnuts, and champ in the upper part of the block, and pipli, walnut, and tún in the lower portion, the oaks (búk and phalat), being also most prized as firewood, should be planted in larger numbers than chestnut and champ.

(iv)—Cleanings and early thinnings.

284. Same remarks as for Mahaldaram Working-Circle, Block I.

(v)—Fencing.

285. This does not appear to be needed, but the guard of the beat must frequently patrol Block I, where cattle-trespass seems to be unnecessarily prevalent.

(5)—POSAMBING WORKING-CIRCLE.

(i)—Cutting of climbers.

286. General remarks as before.

TABLE.

Description of areas.	Acres.	Years of cutting.				Remarks.
Block I—the whole ...	294	1895-96	1899-1900	1903-4	1907-8	
„ Special* ...	...	1893-94	1894-95	1898-97	1897-8	* Over the coupe of the next year.
		1898-99	1900-1	&c.		
Block II†	375		1895-96	1899-1900	1903-4	† Also in 1907-8.
Block III	355	1892-93	1896-97	1900-1	1904-5	
Block IV	355	1893-94	1897-98	1901-2	1905-6	
Block V	380	1894-95	1898-99	1902-3	1906-7	

(ii)—Clearance of the ground under a regeneration-felling and dibbling in of acorns.

287. Nil.

(iii)—Planting of the annual regeneration coupes.

288. The areas to be taken in hand annually are—

Well-stocked area	...	... 16 acres.
Poorly-stocked „	...	Not lessthan 16 „

(*See* Statement of Fellings.)

General remarks the same as for the Senchal Working-Circle.

289. *Nurseries.*—As the area to be planted is small, it is proposed to raise the plants in Goompahar nursery, distant about 8 miles. The arrangement may be tried, but it will probably reduce the expense to make a small nursery on the spot. There is no objection to the immediate planting up of the poorly-stocked area if the money and the plants can be provided; but as it is to be planted closely about 5′ × 5′ with cryptomeria pure or with pipli, it may not be possible to raise sufficient plants for more than sixteen acres a year, say 30,000 plants.

The well-stocked area should be planted chiefly with búk, phalat, and champ; katus, pipli and walnut may also be employed to a certain extent. Other

species should only be used when those named are not procurable, and in such case the latter should afterwards be used to fill vacancies.

(iv)—Cleanings and early thinnings.

290. Same remarks as for Block I of Mahaldaram Circle (*see* para. 270).

(v)—Fencing.

291. This block is very much exposed to cattle-trespass both from the adjoining blocks open to grazing and especially from khas land below the forest. Fencing will therefore be resorted to where other measures for preventing the inroads of cattle are insufficient. It is hoped that the plantation of cryptomeria will prove an effectual barrier when it grows up; and cryptomeria will have a fair chance of growing up, for cattle will not eat it. A fence will, however, probably be needed whilst the plants are young. A quick-set hedge, as recommended by Mr. Chester, might be tried, and in this case the American aloe should be tried, planted on a raised bank. The common bramble (*Rubus ellipticus*) might be planted along with it, and a temporary railing of mallota poles be maintained whilst the hedge is growing.

(6)—MIM WORKING-CIRCLE

(i)—Cutting of climbers.

292. General remarks as for Senchal Working-Circle.

TABLE.

DESCRIPTION OF AREAS	Acres	Years of cutting				REMARKS
Block I—the whole	420	1895-96	1899-1900	1903-4	1907 8	
,, special		1893-94	1894-95	1896-97	1897-98	The annual coupe one year in advance of regeneration fellings
		1898 99	1890 91	&c.		
Block II*	480		1895-96	1899 1900	1903-4	* Also in 1907-8.
Block III	357	1892 93	1896 97	1900 1	1904-5	
Block IV	345	1893-94	1897 98	1901 2	1905 6	
Block V	368	1894-95	1898 99	1902 3	1906-7	

(ii)—Clearance of the ground under a regeneration-felling and dibbling in of acorns.

293. Nil.

(iii)—Planting of the annual regeneration coupes.

294. The areas to be taken in hand in Block I are—

Well-stocked area ... About 19 acres.
Poorly-stocked ,, ... 6 or 7 ,,

(*See* Statement of Fellings.)

General remarks the same as for Senchal Working-Circle.

295. *Nurseries.*—For the earlier years' planting plants will be raised in the Goompahar nursery. A new nursery will be made in Block 1 during 1891-92. Grazing is at present going on in this block, but arrangements have been made (*see* para. 252) for the removal of the bathâns and the closing of the block. The new nursery will be well fenced; and if the cattle have not been with drawn before the coupe of 1892-93 is made, planting will be deferred, arrears being subsequently made up.

The poorly stocked area in the lower part of of the block should be planted mostly with trees suitable for tea-box, wood and firewood. In the upper part of the block champ, búk, phalat and katus should be chiefly planted.

(iv)—Cleanings and early thinnings.

296. The same as for Block I of Mahaldaram Circle.

(v)—Fencing.

297. This will depend upon circumstances. Partial fencing will probably suffice to prevent entry of cattle from the adjoining open blocks.

(7)—NAGRI WORKING-CIRCLE.

(i)—Cutting of climbers.

298. General remarks as for Senchal Working-Circle.

TABLE.

DESCRIPTION OF AREAS.	Acres.	Years of cutting.				REMARKS.
Blocks V & I—the whole	1,030	1895-96	1898-1900	1903-4	1907-8	Blocks II, III, and IV together will be divided into four parts—(*a*), (*b*), (*c*) and (*d*).
,, Special	...	1893-94	1894-95	1896-97	1897-98	
	...	1893-99	1900-1	&c.	...	
Block II	(*a*)365*	...	1895-96	1899-1900	1903-4	* Also in 1907-8.
Block III	(*b*)362	1892-93	1896-97	1900-1	1904-5	
	(*c*)360	1893-94	1897-98	1901-2	1905-6	
Block IV	(*d*)360	1894-95	1898-99	1902-3	1906-7	

(ii)—Clearance of the ground under a regeneration-felling and dibbling in of acorns.

299. Nil.

(iii)—Planting of the annual regeneration coupes.

300. The areas to be taken in hand in Blocks V and I are—

Well-stocked area	...	...	About 29 acres.
Poorly-stocked ,,	...	...	Not less than 35 ,,

(*See* Statement of Fellings.)

General remarks the same as for Senchal Working-Circle.

301. *Nurseries.*—Those made in Palongdong block must be enlarged. This work is provided for in the annual plan of operations for 1891-92. The number of plants required may roughly be estimated thus:—

50 acres planted in lines 20′ × 6′, @ 370 plants per acre, say	...	...	...	...	19,000
14 ,, ,, closely, say about 5′ × 5′, @ 1,750 plants per acre, say	...	...	...	...	25,000
			Total	...	44,000

A broad belt along the lower edge of the forest is to be planted up with cryptomeria, almost pure, if sufficient seed can be obtained; failing this, pipli is recommended interplanted with tún, champ, and walnut. Utis will be planted along the jhoras.

Mohwa, tarsing, arupati, barkholi, and gobria will be useful for planting up exposed blanks, and birch should be tried on steep slopes and ridges. Búk, phalat, katus, and champ will be planted chiefly in the highest parts of the block. The nurseries should accordingly be well stocked with almost all the species named in the list given in para. 262. The demand of tea-planters in this Working-Circle are increasing every year, and it is important that all the suitable ground should, without further delay, be put in a state of productiveness.

(iv)—Cleanings and early thinnings.

302. As prescribed for Block I of Mahaldaram Working-Circle.

(v)—Fencing.

303. The block has suffered much from illicit grazing. It is exposed on all sides, and it would be out of the question to fence the whole block. The remedy lies rather in better supervision, and the removal to a distance

of those bathans in khas lands which are in close proximity to the forest. Fencing will have to be restricted to those parts of the boundary where the cattle mostly enter.

CHAPTER III.

WORKS OF IMPROVEMENT (GENERAL).

304. Under this head will be considered:—

(*A*) Roads.
(*B*) Buildings.
(*C*) Boundaries.
(*D*) Protection from fire.
(*E*) Other works.

305. The forests under consideration consist of two tracts, the eastern and western, as will be seen on referring to the maps accompanying this report. It will be convenient to treat of these tracts separately under each of the above heads.

A scheme of works of improvement drawn up for the next twenty years has recently been submitted by the Divisional Officer (Mr. Haines), as required by the Conservator of Forests in his Circular No. 41M, dated the 7th July 1891. Mr. Haines' report has been consulted, and with slight modifications and additions has been embodied in this chapter, so far as it relates to the forests dealt with in this report. The numbers assigned to the works by Mr. Haines are quoted in brackets, after the numbers of this report, for ready reference.

(*A*)—*Roads.*

306. The importance attached by Sir D. Brandis and Dr. Schlich to improvements under this head has been shown in para. 106.

The concluding portion of Mr. Fernandez's second note on the Darjeeling Working-Plan, dated November 1887, also invites attention to "the absence of anything like a sufficiency of export lines;" and suggests the construction of sledgeways.

(*i*)—The Eastern Tract.

307. The following works are numbered in order of their importance, as it now appears to the writer of this report. It is not considered advisable to prescribe the order of their construction, which must depend upon circumstances which cannot be foreseen. For example, the greater or less urgency of opening up the Singalilá forest, which depends on the duration of the yield from private forests. It is recommended that sections of the proposed system of communications should be developed annually in each Working-Circle or executive charge, combining together to complete the system.

It should be mentioned that a project for the widening and improvement of the first three miles of the Jorbungalow-Pashok road, from Jorbungalow to Rangbi turning, has been prepared by the Public Works Department, and the work pegged out. It is understood that the improvement on this most important export road will be taken in hand at once.

1. (7). A road trace from the third mile of Pashok road through Blocks III and II (Tiger Hill, Rangbi, and Rishap) to the Sureil Spur, to open up the forests on the east of the Senchal range. This trace must ascend gently (about 1 in 100) so as to secure a slight gradient in favour of the load, whilst keeping the road as near the lower edge of the forest as possible. Length, third mile to Sureil Spur, eight miles.

2. (*a*). (12). A road trace from the third mile of Pashok road on the south face of the range through Rangjo and Poomong (Blocks III of Senchal and I of Tukdah Circle) to Rangli-Rangliot on the Gielle Spur. This road, while tapping the forest, will serve the tea estates on the Gielle Spur, and may eventually be continued (as has often been suggested) to join the Tista Valley road near the Reaing bridge, where it would open up the Reaing reserved forest of the Tista Valley round. The trace should therefore have a suitable downward gradient from the 3rd mile. This road should be made by the

Public Works Department, but a preliminary trace should in any case be made by the Forest Officer. Length of line from 3rd mile to Rangli-Rangloit, about 8 miles.

(2) (*b*). An inspection path from the Rangli-Rangliot path (near the foot of block line I—V of Takdah-Circle) rising gently and going north-eastward through blocks V, II, and IV almost to the extremity of the forest on the ridge, and thence descending to the Pashok road near Lopchu forest bungalow. Length, 5½ miles.

3. (*a*). (8) Completion of the traces made in Rangirum and Dawaipani (Block I of Senchal Working-Circle) in 1888-89, 5 miles. Extension 3(*a*). (10) from the lower Gumti at the Setikhola, westward through Block V (Rangnu) and rising 4 or 5 per 100, towards Jorbungalow, for extraction of material for the Jorbungalow, Jalapahar, and Darjeeling markets. Length, 3½ miles.

3. (*b*.) Extension 3 (*b*). (23) from the upper gumti eastward and up to a point near the 5th mile of the Pashok road on the ridge; to tap the Dawaipani block and provide a direct road from Rangirum to the Takdah Working-Circle. Length, about 2 miles. This line was pegged out by the writer of this report in 1888-89, but could not be made for want of funds.

3 (*c*). The path to Rangirum bungalow. Length, 1½ miles. Total length of No. 3, 12 miles.

4. (13 and 17 form part of this line). Completion and widening of the Jorbungalow Tiger Hill path from a point on the Senchal road above Jorbungalow locations to the saddle between Tiger Hill and Senchal G.T.S., and thence around 'Bara Senchal' to the Tiger Hill inspection path, and back to the saddle. Length about 15 miles.

5. (14). A cart road trace from the Darjeeling-Himalayan Railway near the Runumjhora or the Ringtong spur, up in a south-easterly direction to the Chattakpur ridge joining the old Military road near and a few chains north of the south boundary of the Sepoydhura block (V of Mahaldaram Circle). This road was recommended in the annual progress report for 1882-83, para. 83, and would tap also the Dhobijhora forest of the Kurseong Division. Length, 6 miles.

6. "Senchal pagdandi," an old road from Senchal deserted barracks (Senchal pasture block) to the Old Military road near Sonada, to be widened and improved for export of produce from Block IV of Senchal Circle towards Sonada and Hopetown. Length about 3 miles.

7. (9 and 22). A road to open up the Sureil and Mamrim blocks, connecting if possible with Nos. 1 and 5 and with Nos 8 and 9. Length about 5 miles.

8. (Mr. Haines' No. 6 forms the east side of this block). Path round Chattakpur ridge, S. F. block, 12 miles. This path will serve to bring produce from both sides of the hill to the head of paths Nos. 9*a* and 9*b*. Length about 8 miles.

9. Two paths from a point on the Old Military road at the head of block line I-II of Mahaldaram Circle, *i.e.* from the centre of this Circle:—

(*a*) About 2 miles in a north-westerly direction to the Darjeeling-Himalayan Railway for the supply of tea estates on the Ringtong and Hopetown spurs; and

(*b*) About 2½ miles in a south-westerly direction to meet the Darjeeling-Himalayan Railway for the export of produce to Kurseong and tea estates in that direction. These two paths will intersect No. 5, and are designed to tap blocks I and II of the Mahaldaram Circle.

Total length, 4½ miles.

As regards sledgeways, the difficulty is to hit upon lines which will serve important markets, and at the same time tap a sufficient extent of forest to make the undertaking pay. Paths Nos. 9 *a* and 9 *b* may answer these conditions when the other roads and paths have been constructed to collect produce at the head or other convenient points of the sledgeways. At first the paths may be constructed as export paths to be used by coolies carrying loads.

10. The plantation paths in the Rangbul and Dooteria blocks should be kept open as inspection paths. It will probably be sufficient if they are cleared

and repaired every fourth year when climbers are cut in these blocks. Length about 6 miles.

11. (21 and 16). Kurseong-Sureil road (part), 3 miles; and Sureil-Rangbi road (part), 2 miles.

It has been arranged that these roads, formerly kept up by the Cinchona Department, should, as regards the portions within the forest, be kept up by the Forest Department. Total, 5 miles.

(*i*)—The Western Tract.

The following are the most important road works:—

12. (1). A cart road trace from Goompahar saddle along the north face of the Goom range descending as gently as possible to Manibanjan (*see* para. 135). Length 21 miles.

A commencement has already been made, and the work should be steadily pushed on in spite of difficulties. When the most suitable trace has been selected, the Public Works Department should be asked to make the road.

13 (2). A cart road trace from Sukiapokri to Manibanjan, descending 4 % to 5 % to tap Blocks III, IV, and V of Mim Working-Circle and to bring produce from Singalila forest to the head of the Balasan valley (*see* para. 202 *ad. fin.*) to supply tea estates in that valley, as well as for export to Darjeeling *viâ* the Goompahar cart road. A new trace should be laid out, the old one being unsuitable. Length 5 miles.

14. The lower path from Chongtong spur to Mim, through Block I and part of Block II of the Mim Working-Circle should be improved and extended through Blocks II, III, IV and V of this circle, keeping near the lower boundary of the forest. The Deputy Commissioner's permission will be obtained if it is needful to make the road on Government khas land in a few places. This path is needed early to open up the Mim Circle to the tea concerns on the Chongtong spur. Length 10 miles.

15 (3). A cart road trace from Goompahar saddle along the south face of the range, descending gently to Ranichuten on the Nágri spur, and traversing the following blocks:—

Posumbing Working-Circle—all Blocks (V to I).

Nágri Working-Circle Blocks V and I.

A preliminary trace has already been made through the Nágri Working-Circle, which must be widened and improved. It should be extended first into Block I of Posumbing Circle and eventually to Goompahar. This course is advisable, because the eastern blocks of Posambing Circle have already been worked, and the Pubong, Tungsong, and Posumbing tea estates must have access to the western blocks and to the Nágri Working-Circle. Length, 22 miles.

16. (18). Sukiapokri to Nágri spur road.

This was originally made in 1888-89, and has proved a most useful road. It should be further widened and improved. Length 5 miles.

17 (4). From No. 4 *viâ* Debrepani to the Nepal frontier—round the head of the Rangbong Valley. The portion from No. 4 to Debrepani forms the boundary between Blocks V and III of Nágri Working-Circle, and the trace has been continued during 1891-92 to the Rangbong river. These portions must be widened and improved, and the trace should be pushed on as quickly as possible to the lower forest boundary on the Tidham spur, so that the road may be continued by the authorities concerned with a good gradient to Rangdo and Merig. Length, about 9 miles.

18. (19, 20) Paths north of Goom range:—

(*a*) Goompahar to Lepchajagat (Nai inspection path) to be improved	4	miles.
(*b*) Lepchajagat to Sukiapokri, to be completed as an inspection path and made rideable ...	3	,,
Total ...	7	,,

19. A path from a point near the forest boundary on the Burbuttia spur, through the Goom block, to join the Darjeeling-Himalaya Railway. This will be a difficult path to make, but is very much needed. If it is not convenient to make the path up to the cart road within the limits of the forest, permission can, doubtless, be obtained to join the nearest suitable point on the Lamidara road cess road in Bloomfield tea estate, which comes within $\frac{1}{8}$th of a mile of the forest boundary. Length, 3 miles.

Summary of Road Works.

308.

(*i*).—The Eastern Tract.

No.	Description.	Old or new.	Class.	Length in miles.
2	3rd mile to Sureil spur	New ...	Road trace ...	8
2*a*	„ „ to Rangli-Rangliot	„ ...	Ditto ...	8
2*b*	Rangli-Rangliot path to Lopchu	„ ...	Inspection path	5½
3	Rangirum paths	Partly made.	Road trace ...	5
3*a*	„ „ Extension to Jorbungalow, Rangnu block.	New ...	Ditto ...	3½
3*b*	Rangirum paths. Extension to 5th mile, Dawaipani	„ ...	Inspection path	2
3*c*	„ Bungalow path	Old ...	Ditto	1½
4	Jorbungalow to Tiger Hill saddle and around Bara Senchal.	Partly made	Inspection and export path.	15
5	Runum jhora to Mahaldaram (Deoral) ...	New ...	Road trace ...	6
6	"Senchal Pagdandi"	Old ...	Export path ...	3
7	Sureil-Mamrim blocks	New ...	Road trace ...	5
8	"Chattakpur Ridge," circular path	Partly made.	Inspection path	8
9	Two sledge paths	New ...	Ditto and export paths.	4½
10	Rangbul-Dooteria plantation paths	Old ...	Inspection path	6
11	Kurseong-Sureil and Rangli roads	„ ...	Ditto and export paths.	5
	Total (*i*) ...	...	...	86

(*ii*).—THE WESTERN TRACT.

No.	Description.	Old or new.	Class.	Length in miles.
12	Goompahar to Manibanjan, north of range ...	Begun	Road trace ...	21
13	Sukiapokri Manibanjan ditto ...	New*	Ditto ...	5
14	Mim Circle, lower road, Chongtong ridge, *vid* Mim	Part made.	Ditto ...	10
15	Goompahar-Ranichuten	Part made.	Ditto ...	22
16	Sukiapokri to Nagri-spur road	Old ...	Ditto ...	5
17	From Sukiapokri road *vid* Debrepani and Rangbong to Tidham spur.	Part made.	Ditto ...	9
18	Majdura, Dungdungia and Nai	Part made.	Inspection path	7
19	Goom block	New ...	Ditto and export paths.	3
	Total (*ii*) ...	...	...	82
	GRAND TOTAL ...	...	...	168

* The preliminary trace already made is not suitable as a road trace.

(*B*).—*Buildings.*

309. A list of the existing buildings has been given in para. 136. Besides repairs, the following new houses are provided for during 1891-92 :—

	Rs.
Converting Sukiapokri fuel godown into a Forester's quarters, estimated cost	500
Construction of a stable and out-house at Hoom (Tukdah Working-Circle) ...	32
Construction of an inspection hut with stables and servants' quarters at Poomong (Block I—V, Tukdah Circle)	500
Construction of a cook-room at Forester's quarters, Senchal round ...	50
Construction of Forester's quarters and office (Mahaldaram Working-Circle) near Toong Railway Station	600
Construction of out-houses at Manibanjan Inspection hut	50
Revetment walls and improvements at Darjeeling depôt	430

310. It has been pointed out in para. 176 that more inspection bungalows are needed ; that they must be commodious and above all must have sufficient stabling and servants' quarters for two officers (*e.g.*, the Conservator and the Divisional officer, or the latter and any officer attached to the Division). In this damp climate the more important bungalows should be pucca-built ; * seasoned timber only should be used in their construction, at any rate for everything except the roof timbers, and they should invariably be roofed with corrugated iron with boarding beneath. The space beneath the floor should be

* A wooden bungalow built at Pachim (elevation over 7,000 feet) is so cold and draughty as to be almost unhabitable in the cold weather.

excavated to a good depth, and should be well drained and ventilated. Well-seasoned chestnut or oak joists and chestnut or champ planks should be used for the floor. If these points are attended to, the bungalows will require little in the way of repairs and the unpleasantness of decaying wood floors will be avoided. The practice of using unseasoned timber is wasteful and expensive, and it is strongly recommended that separate sanction should be given one year in advance for the cutting and delivery of the timber at the site selected for a bungalow or other pucca building, *i.e.*, one year previous to the date of building given in the list in para. 312. These remarks may appear out of place in a working-plan; but as they have a direct bearing on the expense of management, and officers with little experience in building are apt to overlook the matters mentioned, it is trusted they may pass.

311. As regards the building of inspection bungalows in future, it is recommended that they should be built on a standard plan* with a regulation scale of stabling and servants' accommodation. This would effect an occasional saving of the Divisional officer's time. Rough stone is generally used for the walls which are usually two feet thick; and taking this fact into consideration, the outside measurement of the bungalow need not exceed 50′×30′. The chimneys and fire-places built of stone occupy much space, and in the case of the Lopchu Bungalow extra expense was incurred because this fact was overlooked.

The stables should have stalls for four horses and room for six or eight men (a syce and a grasscutter to each horse). The accommodation for servants should consist of a cook-room and five servants' quarters (two for the servants of each officer and one for peons and chaprasis). The cost of such bungalows will of course vary somewhat, according to the locality and difficulty in procuring labour or transporting materials, but on an average Rs. 2,500 should be allowed in addition to the value of the timber used.

312. The following buildings should be constructed during the first half period. The locality indicated in each case is considered to be that most convenient for the supervision of work in the blocks to be taken in hand for regeneration during the first two periods (64 years); and has been chosen with reference to roads in existence or shortly to be made :—

List of Inspection bungalows or huts to be built during the sixteen years 1892-93 *to* 1907-8.

Year of building.	Description.	Probable cost.
		Rs.
1894-95†	1. An inspection bungalow in Rishap Block (II of Senchal Working-Circle).	2,500
	2. A small inspection hut near the lower boundary of the Mamrim block, or between Blocks I and II of Mahaldaram Working-Circle.	500
1895-96 ...	3. A small inspection hut near the lower boundary of the Mim Working-Circle, say on the Setangbong ridge.	500
1896-97 .	4. An inspection bungalow near the lower boundary of Tasiding Working-Circle, say on Burbuttia spur between Blocks I and II	500
1897-98 ...	5. A small inspection hut near the lower boundary of the Rangbong block, IV of Nagri Working Circle.	500
1898-99 ...	6. An inspection bungalow between Posambing and Nagri Working Circles near the lower boundary.	2,500

* Two or three alternative plans might be devised.

† This date is fixed for the commencement of building in order to allow of provision being made in the budget and for timber to season.

(C).—Boundaries.

313. The improvements to be effected are—

(1) To demarcate correctly the boundary of the Goom block adjoining the Soom Tea Company's land, *i.e.*, the line marked AB in the 2″ map submitted with this report (see para. 24). The acquisition of the Soom land is recommended in para. 26.

(2) To make enquiries respecting and settle the boundary of the Chongtong block, east (I) of Mim Working-Circle, namely, the line marked FG in the 2″ map submitted with this report.

(3) To verify the demarcation of the lower boundary of the Parmaigiri block, Nos. III, IV, and V of Mim Circle (see para. 24).

(4) To demarcate the 'Clover Bank' location at Senchal; or better still to acquire the same (see para. 151).

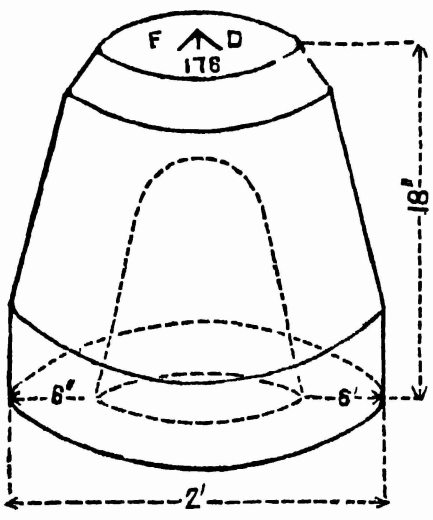
(5) To make the boundaries generally more accessible and to inspect them regularly (see para. 23).

(6) To improve the boundary marks and the demarcation generally (see paras. 21—22).

The length of boundaries and number of boundary marks are approximately shown in the following table:—

Tract.	Artificial boundaries.		Natural boundaries.			Total.	
			Demarcated.		Not demarcated.		
	Length in miles.	Number of marks.	Length in miles.	Number of marks.	Length in miles.	Length of all boundaries.	Number of marks.
Eastern	28	446	14	127	25	67	573
Western	27·5	289	3	8	5·5	36	297
Total ...	55·5	735	17	135	30·5	103	870

314. It is believed that the cheapest and most durable boundary marks could be made of concrete in hollow blocks. The cost of solid concrete blocks for arches at St. Joseph's College was Re. 1, and cornices and ornamental work Re. 1-8 per cubic foot. A simple form of boundary pillar would cost probably Re. 1-4 a cubic foot. It could be cast hollow, with the number and any other desired mark impressed on it, as figured in the diagram. Such a pillar could be carried in a basket without difficulty by a Bhutia coolie to the site and erected, whilst it would be quite heavy enough to prevent removal. It would be of no use to any one except the owner, and its intrinsic value would be small. It is very difficult to get masons to work on the boundary lines, and even then lime, sand, and water have to be collected by coolies at each site. Supervision of the work is difficult, the mortar as a rule is half mud, and the pillar falls to pieces in a few years. Wooden posts, besides being more or less perishable, are often hacked about by coolies and sometimes removed for firewood. The cost



The south-western portion of the district contains the small Deogarh coal-fields and the northern edge of the Raniganj coal-field. The Talcher and Barakar are the groups represented. The boundaries of these coal-fields are often faulted. There are numerous dykes and intrusive masses of mica peridotite and augite dolerite, the underground representatives of the Rajmahal gneiss. The coal in the Deogarh fields is neither plentiful nor of good quality. In the north of the district the rocks disappear beneath the Gangetic alluvium.*

MINERAL RESOURCES

The chief mineral products of economic value are coal, which has already been referred to, building stones, road metal, ornamental stones, lime, pottery clays, iron, copper and lead ores. The Rajmahal Hills contain a considerable variety of rocks suitable for building purposes. The basaltic trap, if carefully chosen, affords a durable building material,which formerly was not only used in temples, forts and other structures in the immediate vicinity of the hills, but was also carried to towns situated at a distance in the plains. Besides trap, there are a number of sandstones suited for building purposes ; and in some places a Talcher sandstone is quarried on a small scale for manufacture into curry-stone, plates, etc. Laterite is found on the tops of some hills and for a considerable distance along their eastern flanks. In many places it is sufficiently compact and dense to be employed as a building material, and evidence of its having been so used is afforded by certain old forts and temples. The basaltic trap is also capable of affording an inexhaustible supply of road metal, but there are only a few localities where it is sufficiently near to rail or water carriage to render it available for export. At present, stone is quarried only on the hills bordering the Loop Line of the East Indian Railway from Murarai to Sahibganj, the most important quarried being those established by Mr. Atkinson at Udhua Nullah and by

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* Memoirs of the Geological Survey of India, Volumes VII and XIII, and Records of the Geological Survey of India, Volume XXVII. The above account was contributed by Mr E. Vredenburg, Deputy Superintendent, Geological Survey of India.

320. *The Forest Staff.*—Proposals having been submitted very recently to Government for the reorganization of the executive establishment, no remarks seem to be called for on that head. It may be necessary, however, to give assistance to the Divisional Officer to enable him to lay out, mark, and estimate the annual coupes in proper time, and to execute such survey works as may be necessary.

CHAPTER IV.

FORECAST.

(*i*).—*Forecast of outturn.*

321. The Inspector-General of Forests in para. 4 of his letter No. 558, dated the 24th July 1890, approved of the fellings being for the present confined within the capability of the forest by means of cultural rules, provided that the areas to be worked each year were prescribed. He pointed out also that this would not obviate the necessity of making an accurate forecast of the outturn. The possibility is based upon area, and in the case of regeneration-fellings the outturn must be restricted to half the standing crop at the most, whilst it is limited by the number of trees in the case of the amelioration and selection fellings.

322. In order to estimate the yield an enumeration of the stock has been made on sample areas aggregating 3,283 acres. Part of this, however (75½ acres), was done to ascertain the stock remaining on the ground in Block I of Senchal Working-Circle at Rangirum, after a felling conducted on the lines laid down for future working had been made (see Nos. 8 and 9 of Appendix VII). A further area of about 95 acres (see No. 10 of the same Appendix) is also included twice, being part of the area included in table No. 7. It was separately estimated as the coupe of 1891-92. If these areas are deducted, the enumeration covers an area of 3,113 acres out of a total of 21,905* acres comprised in the periodic blocks of the seven Working-Circles, or about 14 per cent. This is ample for the purpose of a forecast.

323. It is necessary to describe the method of enumeration, as the crop on the annual coupes must be estimated in the same way. The procedure followed was the measurement of the diameter at breast height. Mr. Chester's enumeration contains diameter classes from 1 foot to 4½ feet, whilst the new enumeration has a class of ½ foot for stems between 3 inches and 9 inches in diameter. The trees over 4 feet in diameter being almost invariably more or less hollow have been counted as 4 feet. The species classes adopted in the recent enumeration are much more numerous than Mr. Chester's, but this does not make any difference as far as the forecast is concerned.

324. The factors for conversion to cords have been calculated by Mr. F. C. Henvey, as shown in Appendix VIII. A larger number of experiments will have to be made in different parts of the forest, and what is more important at different periods, as the hollow and defective trees will gradually be found in smaller proportion and the diameter classes over 3 feet will in time disappear, or be represented only by one or two trees of exceptionally fine growth. It is believed that the factors adopted will be very near the average for the next few years, and as they will, if anything, be increased, they may be accepted as giving a safe forecast.

325. For the regeneration-fellings the yield is estimated in cords, as the bulk of the material will, during the first half-period at least, be firewood, the best trees being kept standing in the interests of regeneration. We may take 80 to 90 cords as representing the best stocked portion of the forest, and 58 cords per acre as the crop on the poorest portions of the area classed as "well stocked," as in the areas thinned out in the Posambing Working-Circle. As cultural rules must influence the outturn, it will be necessary here to make some allusion to the method of treatment. Speaking generally, we should be justified in removing half the growing stock in the first half-period in the case of the

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NOTE.—Of this only 16,692 is well stocked and the percentage on this is nearly 19 %.

regeneration-fellings; but besides neglecting the increment as a set-off against the decay of trees which must unavoidably be left standing, though partially unsound, it will probably be advisable, for sylvicultural reasons, to leave rather more than half the crop standing, especially where it is already thin, provided it is not *absolutely ruined*, which is rarely the case. Where the abundance of the crop and a limited demand permit, it will be well to leave 40 or if possible 45 cords per acre standing and to remove only the surplus. The course followed will also depend upon circumstances, such as aspect, the degree of shelter requisite, the existence or absence of suitable advance growth, etc. The main point to be attained is successful regeneration, and it will be preferable to depend upon the amelioration-fellings and upon supplies from Singalilá and other sources to satisfy the demand rather than compromise the regeneration by cutting too much. At the same time our forecast leaves a certain margin for increasing the outturn of the regeneration-fellings.

326. In the fellings at Rangirum (tables 8 and 9 of Appendix VII) considerably more than 45 cords per acre has been left standing. There is little objection to this, as the Rangirum forest is extremely well stocked and the demand has been satisfied with the produce removed, whilst the canopy does not appear to be too close for regeneration, and the trees left standing can safely remain for ten years more.

Other parts of the forest, however, are not so rich, and though in framing our forecast we allow generally for 40 cords being left standing after the first felling, the officer conducting the felling must be allowed to use his discretion in reducing that quantity should he find that the success of regeneration is fully assured with a less bountiful reserve. He may even go occasionally to the extent of removing half the original crop, which is fixed as the limit.

FORECAST OF ANNUAL OUTTURN OF REGENERATION-FELLINGS.

WORKING-CIRCLES.	Area of average annual coupe in acres.	Factor cords per acre.	OUTTURN.		REMARKS.
			Cords.	Cubic feet solid (approximate).	
					The factors used are explained thus :— Cords.
1. Senchal	65	45	2,925	239,800	Factors based on table 7 say ... ... 85−40=45
2. Mahaldaram ...	33	33	1,089	89,298	Crop intermediate between samples shown in tables 8 and 7 ; factor, say ... ... 78−45=33
3. Takdah	23	22	506	41,492	Crop about the same as that shown in tables 1 and 2 ; factor, say ... ... 62−40=22
4. Tasiding	21	21	441	36,000	Crop intermediate between samples shown in tables 1 and 6 ; factor, say ... ... 61−40=21
5. Posambing ...	8	18	144	11,808	Rather less than Tasiding ; factor, say ... ... 58−40=18
6. Mim	20	30	600	49,200	Crop intermediate between samples shown in tables 2 and 5 ; factor, say ... ... 70−40=30
7. Nagri	29	25	725	59,450	Crop intermediate between samples shown in tables 4 and 6 ; factor, say ... ... 65−40=25
Total ...	199	...	6,430	527,048	Average crop, 73·1 cords per acre.

327. The 'poorly-stocked' areas taken up for regeneration during the first half-period aggregate 1,802 acres, say 113 acres a year, and in some parts remnants of the old forest are found, and scattered trees in others. The produce derived from these is expected to materially swell the total annual outturn, but as it is impossible to forecast the quantity, it is neglected.

328. It now remains to forecast the outturn of the amelioration and selection fellings, and this again is a matter of some difficulty, because the outturn will depend on the appreciation of the officer conducting the felling as to what trees should be felled and what left standing. In order to diminish the risk of errors of judgment, the interval between the amelioration-fellings has been made short. When the Working-plan is revised it may be lengthened. We may be quite sure, however, that the old trees of the largest size will, for

the most part, be removed during the first period, and consequently that the average size of the trees felled will be high (see para. 241).

The following is the estimate :—

Forecast of outturn of amelioration and selection fellings in number of trees.

Eastern Tract.

Working-circle.	Block.	Area in acres well stocked.	Number of standing trees. Large. Unsound.	Large. Sound.	Medium. Unsound.	Medium. Sound.	Remarks.
Senchal	II	1,540	770	231	..	...	The ratio of large to medium-sized trees in the outturn of the next ten years has been assumed according to the present condition of the crop in each block.
Ditto	III	1,570	262	78	523	158	
Ditto	IV	1,478	...	...	739	222	
Ditto ... ... {	V	360	...	...	180	54	'Bara-Senchal' and 'Senchal-Pasture' blocks worked in the same year as periodic Block V.
{	S.F.	884	...	...	177	59	
Total ...		5,832	1,032	309	1,619	493	
Average annual outturn .		...	258	77	405	123	

Selection-fellings.

	Acres well stocked.	Medium-sized trees. Unsound.	Sound.
S.F. 1	238	48	16
S.F 2	237	47	16
S.F. 3	150	30	10
S.F. 4	125	25	8
Total ...	750	150	50
Average (⅕) annual outturn.	...	19	6

Mahaldaram	II	510	255	76	...	...	
Ditto	III	600	...	...	300	90	
Ditto	IV	670	...	...	335	100	
Ditto	V	465	...	...	232	70	
Total ...		2,245	255	76	867	260	
Average annual outturn ...		...	64	19	217	65	
Takdah	II. E	220	22	6	82	27	
Ditto	II. W	215	21	6	80	26	
Ditto	III	225	22	6	90	28	
Ditto	IV	235	24	8	94	27	
Total ...		895	89	26	358	108	
Average annual outturn ...		...	22	7	90	27	
ABSTRACT.							
Average annual outturn.							
Senchal		5,832	258	77	405	123	
Mahaldaram		2,245	64	19	217	65	
Takdah		895	22	7	90	27	
Total ...		8,972	344	103	712	215	
Chattakpur Ridge and Sureil S.F. 1 to S.F. 4	...	750	...	...	19	6	Not included in effective outturn. See para. 43, Statement of Fellings of Mahaldaram Working-Circle.

Forecast of outturn of amelioration and selection fellings in number of trees.

Western Tract.

Working-circle.	Block.	Area in acres well stocked.	Number of standing trees. Large. Unsound.	Large. Sound.	Medium. Unsound.	Medium. Sound.	Remarks.
Tasiding	II	280	70	21	70	21	
Ditto	III	332	83	25	83	25	
Ditto	IV	270	67	20	68	20	
Ditto	V	505	126	38	126	38	
Total ...	...	1,387	346	104	347	104	
Average annual outturn . ..	...	...	86	26	87	26	

FORECAST OF OUTTURN OF AMELIORATION AND SELECTION FELLINGS IN NUMBER OF TREES—*concluded.*

Western Tract—concluded.

Working-Circle.	Block.	Area in acres well stocked.	Number of standing trees. Large. Unsound.	Large. Sound.	Medium. Unsound.	Medium. Sound.	Remarks.
Posambing	II	275	34	11	103	30	
Ditto	III	310	30	12	116	34	
Ditto	IV	265	33	10	99	30	
Ditto	V	220	27	8	83	25	
Total ...	...	1,070	133	41	401	119	
Average annual outturn	...	...	33	10	100	30	
Mim	II	350	131	39	44	13	
Do.	III	337	126	37	42	13	
Do.	IV	332	125	38	41	13	
Do.	V	333	124	38	42	12	
Total ...	...	1,352	506	152	169	51	
Average annual outturn	...	...	126	38	42	13	
Nagari	II	365	136	41	46	14	
Do.	III	362	136	40	45	14	
Do.	IV	360	135	40	45	14	
Do.		360	135	40	45	14	
Total ...	...	1,447	542	161	181	56	
Average annual outturn	...	...	136	40	45	14	

SELECTION FELLINGS. Medium-sized trees.

	Area well-stocked acres.	Unsound.	Sound.
S. F. 1.	90	18	6
S. F. 2.	90	18	6
S. F. 3.	92	18	6
S. F. 4.	92	18	6
	364	72	24
Average (8) ...		9	3

Abstract average annual outturn.						
Tasiding		1,387	80	26	87	26
Posambing		1,070	33	10	100	30
Mim		1,352	126	38	42	13
Nagri		1,447	136	40	45	14
Total ...		5,256	381	114	274	83

SELECTION FELLINGS. Medium-sized trees.

	Unsound.	Sound.
S. F. 1 to S. F. 4 ...	9	3

ESTIMATE OF ANNUAL OUTTURN IN CUBIC FEET.

*Amelioration-fellings.**

Western Tract.						Eastern Tract.					
Unsound trees.			Sound trees.			Unsound trees.			Sound trees.		
No.	Rate.	Cubic feet.	No.	Rate.	Cubic feet.	No.	Rate.	Cubic feet.	No.	Rate.	Cubic feet.
381	200	76,200	114	200	22,800	344	200	68,800	103	200	20,600
274	150	41,100	83	150	12,450	712	150	106,800	215	150	32,250
655	...	117,300	197	...	35,250	1,056	...	175,600	318	...	52,850

* Including "Bara Senchal" and "Senchal Pasture" to be worked during the first period by selection-fellings in conjunction with the wooded portion of Block *N* of Senchal Working-Circle to which treatment by amelioration-fellings is applied.

ABSTRACT.

Unsound trees.			Sound trees.		
No.	Cubic feet.	Average volume.	No.	Cubic feet.	Average volume.
1,711	293,000	171·2	515	88,100	171·1

Proportion of unsound and sound trees, 76·9 and 23·1 respectively

SELECTION-FELLINGS.

WESTERN TRACT.*						EASTERN TRACT.†					
Unsound trees.			Sound trees.			Unsound trees.			Sound trees.		
No.	Rate.	Cubic feet.	No.	Rate.	Cubic feet.	No.	Rate.	Cubic feet.	No.	Rate.	Cubic feet.
9	150	1,350	3	150	450	19	150	2,850	6	150	900

* Yield intermittent.
† Yield intermittent, probably unsaleable, and therefore omitted from forecast of effective outturn.

329. The total estimated outturn is therefore:—

Regeneration-fellings	527,000	cubic feet.
Amelioration and selection fellings ...	382,000	„
Total ...	909,000	

This in itself is barely sufficient to satisfy the annual demand,‡ which in 1890-91 amounted to 798,399 cubic feet,§ including, however, over 100,000 of dry wood and poles. The dry wood will sooner or later be worked out, and poles are not readily saleable.

It is evident therefore that no time should be lost in constructing export roads to make the whole area of these forests available, and also to open up the Singalila forest. It has been noted in para. 327 that the outturn of the regeneration-fellings may be slightly increased, and that some material may be obtained from poorly-stocked areas taken in hand for regeneration (see para. 329). The produce of cleanings and early thinnings will probably contribute only in the blocks nearest to Darjeeling; but by selling the small wood at low rates (*e.g.*, as dry sticks), those who collect the same will be able to work over a larger area, and it is hoped that this material and decaying wood may take the place of a part of the split firewood of better quality which was formely almost exclusively used. The doubts entertained regarding the sufficiency of the outturn constitute an additional reason for an early revision of the present plan, in order that the material left standing in the regeneration-fellings may be made available as early as possible.

(*ii*) *Estimate of Revenue and Expenditure under the Proposed System of Management.*

330. A statement of the revenue and expenditure for the ten years 1880—90 has been given in Part I, Chapter XIV. During the year 1890-91, *i.e.*, before the Tista Valley forests were added, the Darjeeling Division showed the following results:—

		Including Singalilá forest.		Excluding Singalilá forest.
		Rs.		Rs.
Receipts		89,768		87,524
Charges	A. Conservancy and works, Rs. 50,085	78,847	49,637	77,107
	B. Establishments, Rs. 28,762.		27,470	
Surplus ...		10,921		10,417

These figures, however, include the receipts (Rs. 74) and charges (*A.* Rs. 78; *B.* Rs. 10,191; total Rs. 10,269) of the defunct Darjeeling Division.

‡ NOTE.—See Forecast of Revenue giving estimated annual sales of timber and fuel

§ The yield of Singalilá forest is of no account.

Omitting these and the figures for Singalilá, we have for the tract to which this report relates :—

Actuals, 1890-91.

			Rs.
Receipts	... ...	...	87,450
Charges	A Conservancy and works, Rs. 49,559 B Establishments, Rs. 17,279	...	66,838
	Surplus	...	20,612

Forecast for the next ten years, 1892-93 *to* 1901-2.

(*See* statements in para. 334 below.)

			Rs.
Receipts	... ...	...	88,500
Charges	A. Conservancy and works, Rs. 37,700 B. Establishments, Rs. 18,300.	..	56,000
	Surplus	...	32,500

331. In the estimate of the probable revenue and expenditure of the next ten years, care has been taken to avoid making too sanguine a forecast, and perhaps it will be found that the estimate is too cautious. The conditions, however, have been changed, inasmuch as removal by purchasers is to take the place, as far as possible, of departmental agency. It is confidently expected that this will give far better financial results, and much greater improvement of the forests than the old system;* but, at the same time the maintenance of a reserved stock of fuel in Darjeeling will be a drag on the progress of the Division, and prudence dictates a cautious estimate.

The receipts from timber, fuel, and fodder are estimated according to the summary of current annual demand given in Part I at the end of Chapter XIII, with a reasonable allowance for expansion, which is explained in the 'remarks' column. It is quite possible, and even expected, that in consequence of the introduction of a cubic foot rate for timber, the receipts under II A will fall off considerably, and may not recover for two or three years ; but if tact is used and fair allowance made, in charging only for wood really fit for sawing, there need be no cause of alarm. The recovery of this item of revenue is certain, and the old system of selling mature timber by the tree should on no account be reverted to. Poles will of course be sold at a certain price a piece according to the tariff.

The rate fixed for the most important timbers, champ and búk, from standing trees, is now the same as the rate charged last year† for dead wood of the same species of which the price has now been fixed at one anná per cubic foot less than last year.

The receipts from fuel sold from the forest are estimated at Rs. 3-2 per cord. The rates now in force vary from Rs. 3 per cord for mixed wood to Rs. 5 for oak. The sales of the latter are about 10 per cent. of the total, and the rate is calculated on this basis.

The estimate of revenue from other sources is based on the actuals of the past ten years with a moderate margin for gradual expansion. For past revenue under II, see Part I, Chapter XI.

Expenditure (*A.* 'Conservancy and Works') is calculated according to the proposals for future management, and provides for a more liberal expenditure on improvements than was formerly incurred. Under *B.* the total expenditure is taken from the average of the past ten years, with an allowance of 25 per

* Note.—See opinions quoted in para. 121.

† "The sales of dead and fallen timber in 1890-91 amounted to 44,443 cubic feet, the highest on record ; *see* Part I, Chapter XI.

cent. for expansion of the executive, protective, and office establishments on account of reorganization :—

The following detailed statements are to show that adequate provision is made for carrying out the plan :—

Estimated Average Annual Receipts for the next ten years.

Head of service.	Particulars.	Items.	Amount.	Remarks.
		Rs.	Rs.	
I*a*.	Sale of 1,000 cubic feet of scantling* sold at Re. 1-4 per cubic foot	.....	1,250	* See para. 250.
I*b*.	Fuel sold to Commissariat Department†—			† No estimate is made for troops at Lebong, the barracks not being yet built.
	Firewood, 41,000 mds. @ Rs. 33 per hundred	13,530	.....	
	Charcoal, 2,000 bags, @ Re. 1 per bag	2,000	.....	
	Sale of reserve stock of Darjeeling depôt‡—			‡ This material is already in the depôt.
	Firewood, 150 cords, @ Rs. 10-8 per cord	$\left(\frac{2,475}{10}\right)$	.....	
	Charcoal, 10,000 bags, @ Re. 1-2 per bag	$\left(\frac{11,250}{10}\right)$	.....	
	Charcoal, 5,000§ bags, @ Re. 1 per bag	5,000	.....	§ See para. 250.
	Miscellaneous receipts	100	22,000	
II*a*.	Sale of timber from the forests‖ :—			‖ Outturn of timber removed by purchasers— 1880-90 :—
	Estimated current demand, C.ft. / Probable demand, C.ft.			Per cent. of total
	For Darjeeling ... ... 100,000 / 125,000			1880-1885 61
	„ Military works ... ... 5,500 / 5,500			1885-1890 39
	„ Ditto, Lebong ... ... 2,500¶ / 3,000			100
	„ Tea plantations ... ... 30,000 / 40,000			
	„ Other demands ... ... 5,000 / 6,500			There has, however, been a decided increase since 1885-86, and the current demand is much above the average of the past ten years.
	Total ... 143,000 / 180,000			¶ This is $\frac{1}{10}$ of $\frac{1}{20}$. The other half is expected to be taken from private forests and Sikhim.
	@ Re. 0-3-0	.....	33,750	
I*b*.	Sale of fuel from the forests (*a*) :—			(*a*) This is a moderate estimate. The outturn removed by purchasers from 1880-90 in per cent. of total was—
	Estimated current demand, C.ft. / Probable demand, C.ft.			1880-1885 88
	For Darjeeling ... ... 400,000 / 500,000			1885-1890 02
	„ Tea plantations ... ... 160,000 / 200,000			100
	„ Other demands ... ... 20,000 / 25,000			
	Total ... 580,000 / 725,000			
	Firewood ... ... 625,000, say, 7,623 cords, at Re. 3-2 ...			
	Dry sticks ... ... 100,000 „ 1,923 monthly permits @ As 7 each	24,360	25,200	
I*c*.	Sale of bamboos	840		
I*d*	Grazing and Fodder :—	.....	Nil.	
	Grazing, say	2,000(*b*)	3,500	(*b*) This is less than current revenue, because compensation is now credited under V, Miscellaneous
	Fodder „	1,500		
II*e*	Minor produce, say	.....	200	
V	Miscellaneous „	.....	2,100(*c*)	(*c*) Includes one-tenth of the estimated sale value of the Darjeeling fuel depôt, to be sold on expiry of the lease in September 1895.
	Total receipts ...	.....	88,000	

Estimated Average Annual expenditure under "A." Conservancy and Works for the next ten years.

		Rs.	Rs.	
A II*a*.	Cost of 1,000 cubic feet of scantling delivered at depôt, @ As. 10 per cubic foot	625	.....	
	Contingencies, say	75	700	
A II*b*.	Cost of 41,000 maunds of firewood delivered at Jalapahar, @ Rs. 16-8 per 100 maunds	6,765	.....	
	Do. of 7,000 bags of charcoal from sale depôt, @ As. 7	3,062	.....	
	Temporary establishment	864	.....	
	Contingencies	309	11,000	
A II,	Temporary establishment, say	.....	900	
A VI.	Stores, tools and plant	.....	350	
A VII*a*.	Making 17 miles of road trace and inspection paths per annum, @ Rs. 250 per mile	4,250	.....	
	Repairs to existing lines	1,750	6,000	
A VII*b*.	New buildings	1,000	.....	
	Repairs and contingencies	1,000	2,000	
A VII*c*.	Other works	.....	100	
A VIII*a*.	Clearing 56 miles of boundaries @ Rs. 4-8	252	.....	
	Improvement of boundary marks (*d*)	500	.....	(*d*) See para. 314
	Contingencies, say	48	800	
A VIII*b*.	Acquisition of clover bank location (*e*)	70	.....	(*e*) See paras. 151 and 313.
	Ditto of other lands (*f*)	1,920	2,000	(*f*) See para. 26.
A VIII*c*.	Pay of a surveyor, for 6 months, @ Rs. 50	300	.....	
	Maintenance of block lines, experiments, and contingencies ...	100	400	
A VIII*d*.	Nursery works, including pay of 7 malis	1,000	.....	
	Planting regeneration coupes ; 262 acres a year at an average cost of Rs. 20 per acre	5,240	.....	
	Planting closely on poorly-stocked areas say 50 acres a year, @ Rs. 40 per acre	2,000	8,240	
A VIII*e*.	Protection from fire ; average	.....	100	
A VIII*f*.	Clearing ground under regeneration-fellings, say 5 acres, @ Rs. 5 (in Senchal Circle)	25	.....	
	Dibbling in acorns (in Senchal Circle)	5	.....	
	Fencing plantations, say 5 miles, @ Rs. 50	250	.....	
	Cutting climbers, executing clearings, and general works of improvement	2,000	2,280	
A IX*b*.	Law charges, average	.....	10	
A IX*c*.	Other charges	.....	1,120	
	Total expenditure A. Conservancy and Works ...	.....	36,000	

Estimated Average Annual expenditure under "B." Establishments for the next ten years.

Head of service.	Particulars.	Item.	Amount.	Remarks.
		Rs.	Rs.	
BIb	Pay of Divisional Officer, average rate Rs 650 per mensem, Rs 7,000 × ⅘	5,200	.....	
	Pay of 1 Extra Assistant Conservator @ Rs. 200 per mensem, Rs 2,400 × ⅘	2,000	7,200	
BIc.	Pay of forest establishment, present scale Rs 338 per mensem	4,056	...	
	Add—Allowance for expansion due to reorganization, say 25 per cent.	1,014	5,070	
BId.	Office establishment @ Rs 125 per mensem, 1,500 × ⅘	.....	1,000	
BIe.	Hill allowance of office establishment @ Rs 25 per mensem, 300 × ⅘	.....	200	
BIIb.	Travelling allowance of Divisional Officer @ Rs. 200 per mensem, 2,400 × ⅘	1,600	.....	
	Ditto of Extra Assistant Conservator @ Rs. 125 per mensem, 1,500 × ⅘	1,250	2,850	
BIIc.	Ditto of forest establishment, say	1,600	..	
	Add—Allowance for reorganisation @ Rs 10 per cent.	160	1,760	
BIId.	Travelling allowance of office establishment @ Rs. 25 per mensem Rs. 300 × ⅘	.....	200	
BIIIb.	Carriage of tents and records, say	.....	50	
BIIIc.	Rents, rates, and taxes	.....	370	
BIIIe.	Postage, say Rs. 15 per mensem	.....	180	
BIIIf.	Sundries, say	.....	120	
	Total "B" expenditure	.....	19,000	
	Grand Total expenditure	.....	55,000	
	Surplus	.....	33,000	

END OF PART II.

APPENDIX I.

STATISTICS RELATING TO CLIMATE.

1—Table of Rainfall.

Darjeeling.

Season.	Month.	Normal mean of month.	Normal mean number of rainy days.	Heaviest fall in any day for last four years.	Remarks.
		Inches.	Number.	Inches.	
Winter	December ...	0·21	0 8	.....	
	January ...	0 69	2 8	0 27—1·50 1888 1889	
	February ...	1·14	3·8	0·01—1·23 1890 1889	
	Total ...	2 04	7 4		
Spring	March ...	2·28	5 4	0 04—1·09 1890 1887	
	April ...	3·93	10·9	0·78—2·42 1888 1887	
	May	7·57	18·1	0 73—9·17 1888 1887	
	Total ...	13·78	34 4		
Summer	June	24 02	24 3	1·18—6·44 1888 1890	
	July	30 36	27 7	3 24—6·09 1887 1889	
	August ...	26·67	26·7	3 22—6 15 1890 1887	
	Total ...	81·05	78 7		
Autumn	September ...	17·42	22 1	1·92—6 67 1889 1890	
	October ...	6·10	7·6	0 03—6 37 1888 1890	
	November ...	0·22	0·8	0 03—0 50 1887 1888	
	Total ...	23 74	30 5		
	Total of year ...	120 61	151 0		

2.—Table of Temperature (Deg. Fahr.)

Darjeeling.

Season.	Month.	Extremes of past four years 1887—1890.		Normal mean daily.		Normal daily range.	Normal daily mean.	Remarks.
		Highest	Lowest.	Maximum	Minimum.			
Winter	December ...	56 8	30 7	48 9	36 8	12 1	42·9	
	January ...	58 8	21 9	44 3	34 6	9 7	39 5	
	February ...	59 2	21 9	45 8	33·8	12 0	39 8	
Spring	March ...	64·1	36 2	56 8	43 3	13 5	50 1	
	April ...	68 1	38 9	61 4	46 9	14 5	54 2	
	May ...	72·1	40 1	62 6	50 4	12 2	56 5	
Summer	June ...	71 6	49 6	64 7	55 2	9 5	60·0	
	July ...	71 1	50 1	66 3	57 3	9 0	61 8	
	August ...	71 6.	53 6	66 2	56 8	9 4	61 5	
Autumn	September ...	70 6	46 2	64 9	55 2	9 7	60 1	
	October ...	68·6	42 2	60 8	49 0	11 8	54 9	
	November ...	62 1	37 9	54 4	41 4	13·0	47·9	

APPENDIX I—*continued.*

STATISTICS RELATING TO CLIMATE—*continued.*

3.—TABLE OF HUMIDITY.

Darjeeling.

SEASONS.	Month.	Extremes of last four years 1887 to 1890 (mean of month).		Normal mean of month 8 a m.	REMARKS.
		Highest 8 a m.*	Lowest 8 a m.*		
Winter ..	December ..	91	62†	74	* Previous to 1889 the means are of 10 A M.
	January ..	90†	82	74	
	February ...	88‡	81	71	
Spring ...	March ...	79	58	66	
	April ...	84	73§	71	
	May ...	93	86	86	
Summer ...	June ..	97	92	93	
	July ...	98	93	94	
	August ...	97	93	93	
Autumn ...	September ..	94	91	92	
	October ..	87	85	76	
	November ...	77	73	69	

† Mean of 28 days.
‡ „ „ 27 „
§ „ „ 29 „

Note.—The figures represent the relative humidity or percentage of saturation.

4.—TABLE OF CLOUD.

Darjeeling.

SEASON.	Month.	Extremes of last four years 1887 to 1890 (mean of month).		Normal mean of month 8 a.m.	REMARKS.
		Highest 8 a.m.*	Lowest 8 a.m *		
Winter ...	December ...	5 4	1·4	3 1	* Previous to 1889 the means are of 10 A M.
	January ...	8 1	5 2†	5 1	
	February ...	6 3	3 9‡	4 6	
Spring ...	March ...	6·4	2·2	4 7	
	April ...	6 1	5 3	5 6	
	May ...	8 3	6 9	7 5	
Summer ...	June ...	9 2	8 5	8 7	
	July ...	9 7	8 8	8 8	
	August ...	9 6	8 8	8 9	
Autumn ...	September ...	8·7	7 0	7 9	
	October ...	5 9	5 3	5·9	
	November ...	4 4§	2 8	3 1	

† Mean of 29 days.
‡ „ „ 27 „
§ „ „ 28 „

Note.—A completely clear sky is indicated by 0.
An entirely overcast sky by 10.

APPENDIX I—*continued.*

STATISTICS RELATING TO CLIMATE—*continued.*

5.—TABLE OF WIND VELOCITY.

Darjeeling.

Highest hourly velocity of wind in each month, during the period 1884—1888, *with the normal hourly velocity, percentage and direction in each month.*

MONTH.	HIGHEST HOURLY VELOCITY DURING—						Normal wind velocity in miles per hour.	AVERAGE RESULTANT.	
	1884.	1885.	1886.	1887.	1888.	Period 1884 to 1888.		Percentage.	Direction.
January	38	..	28	...	...	38	3	22	S. 84° W.
February ...	39	...	30	...	.	39	5	33	S. 83° W.
March	48		55	...	..	55	7	43	S. 77° W.
April	.	36	47	...	44	47	8	49	S. 72° W.
May	...	42	28	...	47	47	6	46	S. 79° W.
June	...	45	65	...	45	65	5	5	S. 88° E.
July	...	30	27	...	40	40	3	43	N. 86° E.
August . ..	...	37	36	...	63	63	3	32	N. 84° E.
September ..	...	...	28	...	26	28	3	12	S. 7½° E.
October ...	...	..	25	..	29	29	3	5	S. 8° E.
November . .	...	...	13	..	21	21	3	8	N. 61° W.
December	...	...	23	.	16	23	2	4	N. 54° W.

Example.—The formula 5 S. 88°E., which was the resultant wind direction in June at Darjeeling, indicates that the calculated resultant of all the wind directions registered was S. 88° E., and that the percentage of prevalence of this wind was five per cent.

6.—RAINFALL NORTH OF GOOMPAHAR RANGE AND OF MIM WORKING-CIRCLE.

Monthly Rainfall.

(Mim Tea Estate.)

YEAR.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1890 ..	0·69	0·03	0 08	6 99	7·49	31·64	62·01	26·33	16·04	8·90	...	0·02	160·12
1889 ..	3·60	3·81	1·43	7·01	6 78	32 26	47 03	24·44	15 53	1·63	...	...	143 52
1888 ..	1·21	1·43	2 25	3·27	6 80	8·52	37 99	19 82	12 87	0 09	0·43	0·02	94·90
1887 ...	4·57	0 37	2 68	8 52	20 17	20 64	36 07	37 93	17·13	3·75	0 04	.	151 85
1886	0·10	0·56	3 26	4 62	7 27	19 28	35 11	34·16	27 47	1·81	0 42	0·07	134·13
1885 ..	0 78	0·10	4·52	8 39	11·59	24·18	44 44	32 50	24·08	1·86		2·55	154·99
1884 ..	0·38	4·28	0 44	6 18	6 40	24 22	31·25	20 50	10·11	11·43	...	...	115 19
1883 ...	3 31	1·16	0 67	2 33	9 68	39·03	34·09	34·96	13·71	0 84	...	0·27	139·55
1882 ..	0·19	0 98	3 90	4·21	17 82	38·90	29 67	39 19	21 64	14 85	0·46	0 24	172 13
1881	0·31	1·37	2·62	2 15	12 35	34·92	25 28	34·06	33 85	7·42	1·50	...	155·83

Rainfall according to Seasons.

(Mim Tea Estate.

SEASON.	Month.	LOWEST.		HIGHEST.		Average inches.*	REMARKS.
		Year.	Inches.	Year.	Inches.		
Winter ...	December	1881-84-87-89	...	1885	2 55	0·32	
	January	1886	0·10	1887	4·57	1·51	
	February	1890	0 03	1884	4·28	1·43	
Spring ..	March	1890	0·08	1885	4·52	2·19	
	April	1881	2·15	1887	8·52	5 36	
	May	1884	6·40	1887	20·17	8·63	
Summer ...	June	1888	8·52	1885	39 03	25·36	
	July	1881	25·28	1890	62 10	38 29	
	August	1888	19 82	1882	39 19	30 39	
Autumn ...	September .	1884	10·11	1881	33 85	19·24	
	October	1888	0 09	1882	14 85	5·21	
	November ..	1883-84-85-89-90	...	1881	1 50	0 29	

* Calculated from the figures of 1881—1890.

7.—RAINFALL NORTH OF GOOMPAHAR RANGE AND OF TASIDING WORKING-CIRCLE.

Monthly Rainfall.

YEAR.	Tea estate.	January.	February.	March.	April.	May.	June.	July.	August.	September	October.	November.	December.	Total.
1890 ...	Rishihot ..	0·32	0·01	0 22	4 15	7·15	23·57	52 75	23·21	15 05	8·70	...	0·04	134·37
	Bloomfield ..	0 32	0 06	0·12	4 60	7·32	20·83	63·60	20 29	14·40	8·10	...		146·64
1889 ...	Rishihot ...	2 98	2·68	0 32	4·08	4 79	23·37	48 06	14·19	13·75	2·94	..		112·11
	Bloomfield ...	...	3 24	2·42	2 31	5·09	21 88	49 41	15·74	9·22	1·82	0·15		112·28
1888 ..	Bloomfield ...	1 18	1 36	1·10	2·77	3·32	4 96	34·60	21·07	9·02	0·05	0·45	..	79·88
1887		2·43	0·02	2 05	5 34	6 76	25 04	17·53	41·00	15 52	3·82	.	0·10	119 70
1886 ...			0·10	2·53	1·56	8 26	17 24	34 40	39 84	19·94	1 53	...		125 49
1885 ...		0·20		5 14	6 70	7 52	21 75	33 21	28 40	22 31	1·18	..	1 93	126 68
1884		0·30	1 87	0·36	3 17	3 98	15·87	30 67	14 35	6·63	6 16	..	..	83 61

APPENDIX I—*continued.*

STATISTICS RELATING TO CLIMATE—*continued.*

Rainfall according to Seasons.

(*Bloomfield Tea Estate.*)

Season.	Month.	Lowest.		Highest.		Average.*	Remarks.
		Year.	Inches.	Year.	Inches.		
Winter ...	December ...	1884-85-86-87-90	...	1885	1·93	0·29	
	January ...	1886, 89	...	1887	2·43	0·63	
	February ...	1885	...	1889	3·24	0·95	
Spring ...	March	1890	0·12	1885	3·14	1·67	
	April	1886	1·56	1885	6·76	3·79	
	May	1888	3·32	1886	8·26	6·08	
Summer ...	June	1888	4·96	1890	26·83	19·32	
	July	1887	17·53	1890	63·60	37·67	
	August	1884	14·35	1887	41·09	25·83	
Autumn ...	September ...	1884	6·88	1885	22·31	13·90	
	October	1888	0·05	1890	5·10	3·24	
	November ...	1884-85-86-87-90	...	1888	0·45	0·09	

* Calculated from the figures of 1884—90.

8.—Rainfall south of Goompahar Range and of Nagri Working-Circle.

Monthly Rainfall.

Year.	Tea estate.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1890 ...	Seyok ...	...	1·55	...	3·74	7·68	19·16	29·82	18·28	14·42	8·69	...	...	103·34
	Chamong ...	1·34	...	...	4·96	11·94	25·50	47·50	22 09	15·12	0·59	...		138·13
	Sungma ...	1·00	...	...	4·59	8·53	23 55	44·17	16·77	17·10	9·56	0·06	0·21	126·14
1889 ...	Seyok ...	...	7·06	...	6·07	6·83	21·36	36·68	13·47	9·00	1·85	0·05	...	102·37
	Sungma ...	2·07	3·58	0·41	6·51	8 25	22·61	41·06	17·53	11·73	2·03	0·10	...	116·48
1888 ...	Seyok	...	4·33	...	3·28	7·94	12·70	28·02	13·34	9·49	0·23	0·68	...	80·01
	Sungma ...	0·88	1·10	2·35	2·79	7·29	9·68	28·93	13·17	9·95	0·29	0·71	...	77·14
1887 ...	Sungma ...	4 31	1·21	2·88	5·25	16·22	20 59	21·10	20·52	11·49	2·98	0·04	..	106·59
1886 ...	Ditto ...	1·11	0·44	2·28	2·70	10 08	21·37	22·57	22·34	12·93	2·64	1·58	0·27	106·31
1885 ...	Ditto ...					Wanting.								
1884 ...	Ditto ...	0·25	2·29	0·35	5·14	3 62	16·10	12·33	11·58	5 07	7·87	...	0·03	64·63
1883 ...	Ditto ...	2·30	0·32	0·69	1·94	6 86	26·28	11·40	17·79	3·90	0·29	...	0·14	72·00
1882 ...	Ditto ...	0·27	0·81	1·93	2·36	8·25	25·90	11·21	37·83	15·04	12·18	0·68	0·12	116·56
1881 ...	Ditto ...	0·04	0·49	4·18	6·28	8·59	21·83	10·14	17·10	26·51	5·17	0·68	...	101·01
1880	Ditto ...	1·13	2·18	4·98	2·69	12·89	27·17	23·13	17·07	6·93	7·34	0·52	0·87	108·89

Rainfall according to Seasons.

(*Sungma Tea Estate.*)

Season.	Month.	Lowest.		Highest.		Average.*	Remarks.
		Year.	Inches.	Year.	Inches.		
Winter ...	December ...	1881-87-88-89	...	1880	0·87	0·16	
	January ...	1881	0·04	1887	4·31	1·40	
	February ...	1890	...	1889	3·58	1·24	
Spring ...	March ...	1890	...	1880	4·98	2·00	
	April ...	1883	1·94	1889	6·51	4·03	
	May ...	1884	3·02	1887	16·22	9·06	
Summer ...	June ...	1888	9·68	1880	27·17	21·51	
	July ...	1881	10·14	1890	44·14	22·00	
	August ...	1884	11·58	1882	37 83	19·17	
Autumn ...	September ...	1883	3·99	1881	26·51	12·07	
	October ...	1883-88	2 29	1882	12·18	5·04	
	November ...	1883-84	...	1886	1·58	0·43	

* Calculated from the figures of the years 1880—1890, except the year 1885.

9.—Rainfall south of Goompahar Range and of Posambing Working-Circle and west of Senchal Working-Circle.

Monthly Rainfall.

(*Dooteria Tea Estate.*)

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1890 ...	1·63	...	0·03	...	15·21	23 86	48·22	22·23	13·08	9·95	...	0·25	134·66
1889 ...	2·87	2·31	1 30	6·85	7·14	26·38	44·46	17·13	12·86	4·30	0·09	...	125·75
1888 ...	0·69	1·11	1·79	3·69	6·90	10·62	27 78	9 33	10·09	0·34	0·93	...	73·87
1887 ...	4·65	0·80	2·65	5·34	12·60	19·24	22·53	22·92	13·40	3·13	0·41	...	107 67
1886 ...	0·56	0·28	3·62	5·52	10·11	17·76	27·24	24·52	12·56	3 09	0·56	...	105·62
1885 ..	0 52	0·21	5 66	3·94	7·89	18·86	25·55	18 32	21 90	3·07	..	1·30	107·08
1884 ..	.	...	0·20	8·20	8·51	16·73	12·76*	12·56	5·53	7·38	...	...	79 17

* This figure appears doubtful.

APPENDIX I—*continued.*

STATISTICS RELATING TO CLIMATE—*continued.*

Rainfall according to Seasons.

(*Dooteria Tea Estate.*)

Season.	Month.	Lowest.		Highest.		Average.*	Remarks.
		Year.	Inches.	Year.	Inches.		
Winter ...	December ...	1884-86-87-88-89	...	1885	1·30	0·22	
	January ...	1884	...	1887	4·65	1·56	
	February ..	1884-90	...	1889	2 31	0·67	
Spring ...	March ...	1890	0·03	1885	5·66	2·19	
	April ...	1890	...	1884	8·20	4·79	
	May ...	1888	6 90	1890	15·21	9·76	
Summer ...	June ...	1888	10·62	1889	26·38	19·07	
	July ...	1884	12 76†	1890	48·22	29 76	† There is some doub about this figure.
	August ..	1888	9 33	1886	24·52	18·14	
Autumn ...	September ...	1884	5·38	1885	21·99	12·85	
	October ...	1888	0·34	1890	9 95	4·53	
	November ...	1884-85-90	...	1888	0·93	0·28	

* Calculated from the figures of the years 1884—1890.

10.—Rainfall west and south of Mahaldaram Working-Circle.

Monthly Rainfall.

Year.	Tea estate.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1890 ...	Gyreegong .	1·70	...	...	6·18	10·89	46·50	80·25	36·41	23·13	16·83	...	0·48	222·67
	Eden Vale ...	1·70	...	...	4·26	11·33	43·27	84 24	34 98	16 64	15·57	...	...	211·99
	Gumti ...	2·63	...	...	5·17	15·84	69 22	130·45	58·77	20·01	16·10	...	1·09	319·28
1889 ...	Gyreegong ...	3·21	2·30	0·28	5·40	6·89	37·83	71·41	30 31	20·20	0·87	0·94	...	179·64
	Eden Vale ...	3·19	2 37	0·11	5·74	7·35	34 64	69·44	29·90	18 27	1·70	0·15	0·33	174·19
	Gumti ...	3·74	2·52	0·68	6 90	10·06	51·43	77·80	45·94	22·59	3·83	1·18	...	226·97
1888 ...	Gyreegong ...	1·38	1·73	2·86	9·27	5·27	16·23	60·46	25·22	19·12	0·87	2·20	...	144·61
	Eden Vale ...	1·32	1·24	2·54	4·57	5·78	14·40	58·37	26·24	19·58	0·06	1·65	..	136·05
	Gumti ...	0·95	1·07	2·87	6·54	7·14	28·14	64·02	28·40	22·16	2·58	1·52	...	165·39
1887 ...	Gyreegong ...	5·61	0·84	2 91	6·83	35·83	30·19	43·66	42·06	17·69	5·18	0·59	...	191·59
	Eden Vale ...	5·97	0·67	1·88	5·65	26·92	28·02	39·33	38·82	14·92	3·46	...	...	165·64
	Gumti ...	7·75	...	2·68	8·99	28·04	40·12	35·78	45·62	23·58	4·65	...	...	195·21
1886 ...	Gyreegong ...	No record			...	16·70	42·20	45·80	51·64	32·53	2·57	1·29	0·06	192·79
	Eden vale ...	0·39	0·40	2·50	3·15	11·74	23 84	36·88	44·03	28·58	1·74	1·54	...	154·88
	Gumti ...	0·70	0·13	3·97	1·63	15·42	36·39	48 61	50·93	39·66	4·30	1·26	0·16	202·35
1885 ...	Gyreegong ...	0·50	..	4·48	2·69	12·00	25·14	53·51	34·70	30·80	1·30	...	1·31	166·63
	Eden Vale ...	0·50	0·30	1·02	2·61	8 66	24·53	50 29	33 52	29 67	0·72	...	1·10	153·92
	Gumti ...	0·30	0 45	4·25	3·86	15·25	37·01	67·22	32·18	41·72	1·43	...	1·13	204·80
1884 ..	Gyreegong ..	...	...	0·24	5·88	5·70	28·94	29·99	24·85	8·49	10·00	...	...	114·09
	Eden Vale ...	...	...	...	4 02	6·21	26 23	25 24	22 11	9·02	11·10	...	...	103·93

Rainfall according to Seasons.

(*Gyreegong Tea Estate.*)

Season.	Month.	Lowest.		Highest.		Average.*	Remarks.
		Year.	Inches.	Year.	Inches.		
Winter ...	December ...	1884, 87-88-89	...	1885	1·51	0·29	
	January ...	1884	...	1887	5·81	2·10	
	February ...	1884-85	...	1889	2·30	0·81	
Spring ...	March ...	1890		1885	4 48	1·79	
	April ...	1885	2·69	1888	9 27	6·02	
	May ...	1888	5·27	1887	38·83	13·33	
Summer ...	June ...	1888	16·23	1890	46 80	32·48	
	July ...	1884	29 99	1890	80·25	55·01	
	August ...	1884	24 85	1886	51·64	35 03	
Autumn ...	September ...	1884	8·49	1886	32·53	21·71	
	October ...	1888-89	0 87	1890	16·83	5·37	
	November ...	1884-85-90	...	1888	2·20	0·72	

* Calculated from the figures of 1884—90, with the exception of the first four months of 1886, for which no figures are available.

APPENDIX I—*continued.*

STATISTICS RELATING TO CLIMATE—*continued.*

(*Eden Vale Tea Estate.*)

Season.	Month.	Lowest.		Highest.		Average.*	Remarks.
		Year.	Inches.	Year.	Inches.		
Winter ...	December ...	1884-86-87-89-90	...	1885	1·10	0·20	
	January ...	1884	...	1887	5·97	1·87	
	February ...	1884-90	...	1889	2·37	0·71	
Spring ...	March ...	1884-90	...	1888	2·84	1·21	
	April ...	1885	2·65	1889	5·74	4·29	
	May ...	1888	5·78	1887	20·92	10·57	
Summer ...	June ...	1888	14·40	1890	45·27	27·85	
	July ...	1884	25·24	1890	84·24	51·97	
	August ...	1884	22·11	1887	38·82	32·80	
Autumn ...	September ...	1884	9·02	1885	29·67	19·53	
	October ...	1888	0·06	1890	15·57	4·91	
	November ...	1884-85-87-90	...	1888	1·65	0·02	

* Calculated from the figures of the years 1884 to 1890.

(*Gumti Tea Estate.*)

Season.	Month.	Lowest.		Highest.		Average.*	Remarks.
		Year.	Inches.	Year.	Inches.		
Winter ...	December ...	1887-88-89	...	1885	1·13	0·40	
	January ...	1885	0·30	1887	7·75	2·69	
	February ...	1887-90	...	1889	2·81	0·75	
Spring ...	March ...	1890	...	1885	4·25	2·41	
	April ...	1886	1·63	1887	8·90	5·51	
	May ...	1888	7·14	1887	28·04	15·29	
Summer ...	June ...	1888	28·14	1890	69·22	43·26	
	July ...	1887	35·78	1890	130·45	70·65	
	August ...	1888	28·40	1890	58·77	43·31	
Autumn ...	September ...	1890	20·01	1885	41·72	28·12	
	October ...	1885	1·43	1890	16·10	5·48	
	November ...	1885-87-90	...	1888	1·52	0·66	

* Calculated from the figures of the years 1885 to 1890.

11.—RAINFALL EAST OF SENCHAL RANGE AND SOUTH AND NORTH OF TAKDAH WORKING-CIRCLE.

Monthly Rainfall.

Year.	Tea estate.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1890...	Poomong ...	2·03	...	0·28	6·15	7·97	45·19	81·12	41·07	20·38	13·66	...	0·42	219·17
	Rangli-Rangliot	2·03	...	0·23	4·08	7·08	43·42	78·28	39·91	22·05	11·54	...	0·42	209·64
	Lopchu	...	0·76	0·89	3·68	4·28	25·01	50·20	24·88	12·41	12·16	...	...	134·36
1889...	Poomong ...	2·94	2·63	0·19	4·51	8·53	37·62	71·81	26·55	15·03	2·71	0·95	...	172·77
	Rangli-Rangliot	2·94	2·63	0·19	7·79	8·63	32·77	64·08	23·79	16·23	1·92	1·75	...	103·32
	Lopchu	2·93	1·69	0·16	4·71	5·07	22·59	39·98	14·89	9·33	3·67	0·09	...	105·10
1888...	Poomong ...	1·19	1·50	3·77	5·76	4·37	16·00	40·64	23·48	10·27	0·67	...	...	107·65
	Rangli-Rangliot	1·19	1·50	3·77	5·90	3·62	14·58	43·30	23·97	10·73	1·29	0·44	...	113·29
	Lopchu	2·42			3·16	2·36	7·77	31·23	15·30	10·64	0·31	...	...	73·28
1887...	Poomong ...	3·42	...	2·23	6·78	19·40	31·46	25·72	30·77	15·24	4·12	0·40	...	146·74
	Rangli-Rangliot	3·42	...	2·23	13·42	18·61	33·05	28·57	41·83	13·13	3·33	...	...	157·59
	Lopchu ...	5·02			4·49	13·94	23·58	24·89	31·76	13·42	4·29	...	...	121·30
1886...	Poomong ...	0·12	0·26	3·33	2·73	8·56	29·41	29·70	47·18	22·33	1·45	0·40	...	145·47
	Rangli-Rangliot	18·72					25·04	26·88	43·08	19·76	1·80	0·65	...	136·81
	Lopchu	1·48			1·36	4·09	17·36	13·34	28·42	9·44	2·42	0·28	...	78·19
1885 ...	Poomong ...	0·28	...	2·96	3·50	8·96	22·13	40·21	25·08	26·69	6·35	...	...	145·76

APPENDIX I—*concluded.*

STATISTICS RELATING TO CLIMATE—*concluded*

Rainfall according to Seasons.

(*Poomong Tea Estate.*)

Season.	Month.	Lowest.		Highest.		Average.*	Remarks
		Year.	Inches.	Year.	Inches.		
Winter	December	1885 to 1889	...	1890	0·42	0·07	
	January	1886	0 12	1887	3·42	1·66	
	February	1885-87-90	..	1889	2·03	0·73	
Spring ...	March	1889	0·19	1888	3·77	2·13	
	April	1885	2 73	1887	6·78	4·90	
	May	1888	4·37	1887	19 40	9·63	
Summer ..	June	1888	16·00	1890	45·19	30·30	
	July	1887	25·92	1890	61·12	40·78	
	August	1888	23·48	1886	47·18	34·11	
Autumn ..	September	1888	10·27	1885	26 69	18·32	
	October	1888	0·67	1890	13·06	4·71	
	November	1885-88-90	...	1889	0·96	0·12	

* Calculated from figures of years 1885—90.

APPENDIX II.

THE FLORA.

List of trees characteristic of the forest at different elevations.

Zone.	Species.	Usual mode of occurrence.	Native name.
8,000 feet ...	Rhododendron grande, *Wight.* ...	7,000 to 11,000 feet near ridges	Chimal.
	Litsœa Kingii, *Hook. f.*	Above 7,000 feet, open places ...	Siltimur.
	Ilex dipyrena, *Wall.* ...	7,000 to 9,000 feet, in upper storey.	Lisu.
	Magnolia Campbellii, *Hk. f. & Th.*	Above 7,000 feet, in upper storey.	Lal champ.
	Acer Campbellii, *Hk. f. & T.* ...	Commonest above 7,000 feet, in upper storey.	Kabashi.
	„ sikkimense, *Miq.* ...	7,000 to 9,000 feet, in upper storey.	Lal kabashi.
	Quercus pachyphylla, *Kurz.* ...	Common on ridge; fruits often.	Singori katus.
7,500 feet ...	Acer Campbellii, *Hk. f. & T.* ...	Upper storey	Kabashi.
	Machilus odoratissima, *Nees.* ...	Ditto	Kawla.
	Michelia excelsa, *Blume.* ...	Ditto	Safed champ.
	Lindera assamica, *Kurz.* ..	Lower storey	Sanu paieli.
	Quercus lamellosa, *Sm.* ...	6,000 to 9,000 feet, upper storey	Búk.
	„ pachyphylla, *Kurz.* ..	. ...	Singori katus.
7,000 feet ...	Machilus odoratissimus, *Nees.* ...	Very common, upper storey ...	Kawla.
	Michelia excelsa, *Blume.* ...	Common, ditto ...	Safed champ.
	Quercus lamellosa, *Sm.* ..	Ditto, ditto	Búk.
	„ pachyphylla, *Kurz.* ...	Ditto, especially on ridges, upper storey.	Singori katus.
	„ lineata, *Blume.* .	Fairly common, upper storey	Phalát.
	„ glauca, *Thunb.* ..		
	Castanopsis Hystrix, *A. DC.* ...	Upper storey	Katus.
	Lindera assamica, *Kurz.* ...	Lower storey	Sanu paieli.
	Litsœa elongata, *Wall.* ...	6,000 to 8,000 feet, lower storey, occasionally found in upper storey.	Paieli.
	Lindera pulcherrima, *Benth.* ...	4,000 to 9,000 feet, upper storey	Sisi.
6,500 feet ...	Michelia excelsa, *Blume.* ...	Upper storey	Safed champ.
	„ Cathcartii, *Hk. f. & T.* ...	Ditto	Titi champ.
	Quercus lamellosa, *Sm.* ...	Ditto	Búk.
	„ glauca, *Thunb.* ...	Ditto	Phalát.
	„ fenestrata, *Roxb.* ...	Has generally several stems ...	Arkhaulo.
	Castanopsis Hystrix, *A. DC.* ...	Scattered, ditto ...	Katus.
	Elœocarpus lanceœfolius, *Roxb.* ...	6,000 to 7,500 ditto ..	Bhadrasi.
	Meliosma Wallichii, *Planch.* ...	Upper storey, ...	Dabdabi.
	Bucklandia populnea, *Br.* ...	5,000 to 7,500 feet, ditto ...	Pipli.
	Lindera pulcherrima, *Benth.* ...	Upper storey	Sisi.
	Litsœa elongata, *Wall.* ...	Ditto, broad-leaved variety ..	Paieli.
	Nyssa sessiliflora, *Hook. f.* ...	5,000 to 8,000 feet, upper storey	Chilauni.
	Saurauja nepalensis, *DC.* ...	Lower storey, especially in jhoras.	Gogen.
	Casearia glomerata, *Roxb.* ...	.....	Barkholi.
	Evodia fraxinifolia, *Hook. f.* ...	Lower storey very common ...	Kanakpa.
	Eurya japonica, *Thunb.* ...	Ditto and in open places ...	Jhingni.
	Prunus acuminata, *Wall.* ...	Lower storey	Lali.
	Symplocos theœfolia, *Ham.* ...	Ditto	Kholme and kharani.
	Leucosceptrum canum, *Sm.* ...	Second growth forest ...	Gurpis.
	Cinnamomum Tamala, *Fr. Nees.* ...	Lower storey, on ridges ...	Sisi.

APPENDIX II—*continued.*

THE FLORA—*continued.*

List of trees characteristic of the forest at different elevations—concluded.

Zone.	Species.	Usual mode of occurrence.	Native name.
6,000 feet ...	Michelia Cathcartii, *Hk. f. & T.* ...	Upper storey	Titi champ.
	Quercus glauca, *Thunb.* ...	Ditto	Phalát.
	„ spicata, *Sm.* ...	Ditto	Arkhaulo.
	Castanopsis Hystrix, *A. DC.* ...	Ditto	Katus.
	Bucklandia populnea, *Br.* ...	5,000 to 7,500 feet upper storey	Pipli.
	Nyssa sessiflora, *Hook. f.* ...	Upper storey	Chilaunè.
	Echinocarpus Dasycarpus, *Benth.* ...	Ditto	Gobria.
	Beilschmiedia sikkimensis, *King.* ...	Ditto	Tarsing.
	Phœbe attenuata, *Nees.* ...	Ditto	Lepcha kawla or Lepchaphal.
	Acer villosum, *Wall.* ...	Second-growth forest ...	Kabashi.
	Meliosma Wallichii, *Planch.* ...	Upper storey	Dabdabi.
	Prunus Puddum, *Roxb.* ...	Ditto	Paddam and Payon.
	Alnus nepalensis, *Don.* ..	Ditto	Utis.
	Amoora decandra, *Hiern.* ...	Lower storey	Thali and Khali.
	Turpinia pomifera, *DC.* ...	Ditto	Thali.
	Rhus semialata, *Murray.* ...	Second-growth forest ...	Bhakhiamilo.
	Litsœa citrata, *Blume.* ...	Ditto and lower storey ...	Siltimur.
	Lindera pulcherrima, *Benth.* ...	Upper storey	Sisi.
	Cinnamomun obtusifolium, *Nees.* ...	Generally in lower storey ...	Sinkoli.
	„ Tamala, *Fr.Nees.* ...	Ditto often on ridges ...	Sisi.
	Macaranga denticulata, *Muell.* ...	Second, growth forest ...	Mallota.
	Debregeasia velutina, *Gand.* ...	Ditto and lower storey often in jhoras.	Toushiari.
	Saurauja nepalensis, *DC.* ...	Ditto ditto ...	Gogen.
	Casearia glomerata, *Roxb.* ...	.....	Barkholi.
	Leucosceptrum canum, *Sm.* ...	Ditto ditto, often gregarious.	Gurpis.
	Eurya acuminata, *DC.* ...	Very common in undergrowth and in open places.	Jhingni.
	Mœsa indica, *Wall.* ...	Generally in open places, gregarious.	Bilauni.
Below 6,000 feet ...	Quercus glauca, *Thunb.* ...	Upper storey	Phalát.
	„ spicata, *Sm.* ...	Ditto	Arkhaulo.
	Castanopsis Hystrix, *A. DC.* ...	Ditto	Katus.
	Michelia lanuginosa, *Wall.* ...	Ditto	Gogay champ.
	Beilschmiedia sikkimensis, *King.* ...	Ditto	Tarsing.
	Engelhardtia spicata, *Blume.* ...	Ditto and second-growth forest.	Mowa.
	Betula cylindrostachys, *Wall.* ...	Scarce. Found in comparatively dry situations.	Saur.
	Juglans regia, *Linn.* ...	Upper storey	Akhrot.
	Cedrela Toona, *Roxb.* ...	Ditto	Tún.

APPENDIX II—*continued.*

THE FLORA—*continued.*

Classified list of the more important Plants found in the Darjeeling Forests.

Scientific name.	Native name.	Elevation.	Formula.	Number of rings per inch of radius	Deciduous or evergreen.	Time of— Flowering.	Time of— Fruiting.	Remarks.	Habit.*
Magnoliaceæ.		Feet.				Month.	Month.		
Magnolia Campbellii, *H. f. & T.*	Lál champ	Above 7,000	$\frac{60-80}{30-50+10-20}$	11	D	3 to 4	9 to 10	Used for planking	1
Michelia Cathcartii, ,, ..	Titi champ ...	5,000—7,000	$\frac{60-80}{20-30+4-8}$	8 to 9	E	6	10 to 11	Used for planking for building and tea boxes	1
,, excelsa, *Blume* .	Safed or seti champ.	5,000—8,000	$\frac{60-100}{40-50+10-15}$	8 to 11	D	3	10	Deciduous (2-4) or sub-deciduous. The principal wood for planking, and much used for general purposes. Light, durable and does not warp.	1
,, lanuginosa, *Wall.*	Gogay champ	5,000—7,000	$\frac{40-80}{20-30+4-8}$	6	D	9	12 to 1	Occasionally used for planking	1
Schizandra grandiflora, *H. f. & T.*	Singoto lahra	6,000—10,000	...	...		5	6 to 7	Large climber. Fruit edible	3
Berberideæ.									
Berberis nepalensis, *Spreng*	...	4,000—8,000	$\frac{15-20}{0-5+1-2}$	...	E	9 to 11	3 to 4	Common. In moist situations under shade ..	3
Holboellia latifolia, *Wall.* ..	Gofala lahra .	4,000—9,000	...	...	...	4 to 5	12	Climber. A fodder	...
Pittosporeæ.									
Pittosporum floribundum, *W. & A.*	...	5,000—7,000	..	...	..	4	2 to 3	Common at low elevations, erect, or sometimes very large and scandent.	3
Polygaleæ.									
Polygala arillata, *Hamilt.* ...	Karima	4,000—7,000	...	...	...	6 to 8	10	Root said to be used in the fermentation of murwa beer Not common.	3
Hypericineæ.									
Hypericum patulum, *Thunb.* ...	...	3,000—7,000	...	...	...	6 to 7	11 to 12	Characteristic of open places	3
Ternstrœmiaceæ.									
Eurya japonica, *Thunb.* ...	Jhingni ...	3,000—6,000	$\frac{30-40}{5-15+3-4}$	6 to 8	E	6	11	Chiefly in second-growth forest. Coppices freely.	1/2
,, symplocina, *Blume.* ...	Ditto ...	5,000—7,000	$\frac{30-40}{5-15+3-4}$	7	E	10	2 to 4	Generally common in high forest	
,, acuminata, *DC.* .	Sanu Jhingni	3,000—7,000	$\frac{15-20}{5-10+1-2}$	...	E	3 to 4	6	Common specially in second growth forest ...	3, 2
Camellia drupifera, *Lour.* ...	Hingua, Harré	3,000—7,000	$\frac{15-20}{0-3+1-2}$	...	E	1	...	Wood strong, used for axe and hoe handles ..	3, 2
Actinidia strigosa, *Hook f. & T.* .	Tikiphal ...	6,000—8,000	...	...	...	5	9	A large climber with edible fruit	3
Tiliaceæ.									
Echinocarpus Daycarpus, *Benth* ..	Gobria ...	5,000—6,500	$\frac{60-100}{15-30+8-20}$	8 to 10	D	10	11 to 12	Common. Specially fine on southern slopes of Goompahar Range. Used for box planking.	1
Elæocarpus lanceœfolius, *Roxb.* ...	Bhadrasi ...	6,000—8,000	$\frac{60-100}{20-40+8-12}$	8	E	8	8	Common. Used for house and box planking. Growth generally straight.	1
Geraniaceæ.									
The balsams are all good fodder plants the following are the commonest :—									
Impatiens puberula, *DC.*	...	...	...	..	...	...	5	The earliest flowering. Flowers violet, 1-2 feet	4
,, discolor, *Wall.* ..	...	...	...	..	...	...	7	Flowers violet and light purple, 2-3 ,,	4
,, scabrida, *DC.*	...	...	...	...	...	...	7	Flowers yellow, spotted red, stout ...	4
,, stenantha, *Hook f.* ...	Cheerla ...	...	...	...	...	...	7	Flowers yellow, Gregarious in wet places, very common.	4
Rutaceæ.									
Evodia fraxinifolia, *Hook f.* ...	Kanakpa ...	4,000—7,000	$\frac{20-50}{10-30+2-3}$	4 to 6	D	5	10 to 2	Abundant in blanks and second-growth forest. Wood of no value, but as it only gives a light shade, its presence is rather useful than otherwise. Oil used for dysentery.	2
Zanthoxylum alatum, *Roxb.*	Asal Timur	4,000—7,000	.....	...	E	10 to 11	...	Wood hard, used for cleansing teeth, and the fruits as a condiment.	3, 2
,, scanthopodium, *DC.*	Gogay Timur	4,000—7,000	$\frac{15-20}{0-5+1-2}$	...	D	9 to 11	9 to 11	Exceedingly common in second-growth forest	3, 2
,, oxyphyllum, *Edgew.*	Timur ...	6,000—9,000	... ..	...	...	5	5 to 6	Common, often with long scandent branches, generally under shade.	3
Skimmia laureola, *Hook f.* ...	Chumlani ..	6,000—10,000	$\frac{15-20}{0-5+1-2}$	...	E	4	11 to 3	Very common, especially in damp ground under shade, wood hard, used for axe handles.	3
Toddalia aculeata, *Pers.* ...	...	Up to 7,000	...	...	...	2	12	Rambling, prickly	3
Meliaceæ.									
Cedrela Toona, *Roxb.* .	Tuni ...	Up to 7,000	$\frac{80-120}{40-60+10-20}$	3 to 9	D	7	11 to 12	Old trees now very scarce. Wood excellent for planking of all kinds, durable; leaves eaten by cattle Coppices freely	
Amoora decandra, *Hiern.* ..	Titi, Thali, Kali	3,000—6,000	$\frac{20-30}{5-15+2-3}$	...	E	...	2 to 3	Common, especially in second-growth forest Sometimes confounded with Turpinia pomifera.	

* { Trees usually forming the upper storey in these forests ... 1
Trees not usually found in the upper storey 2
Shrubs or woody climbers 3
Herbs or herbaceous climbers 4

APPENDIX II—*continued.*

THE FLORA—*continued.*

Classified List of the more important Plants found in the Darjeeling Forests—continued.

Scientific name.	Native name.	Elevation.	Formula.	Number of rings per inch of radius	Deciduous or evergreen.	Time of— Flowering.	Time of— Fruiting.	Remarks.	Habit.*
Ilicineæ.		Feet.				Month	Month.		
Ilex insignis, *Hook. f.* ...	Lisu ..	6,000—8,000	$\frac{20-25}{5-15+2-3}$	6	E	3 to 4	11 to 3	Common. Used for fuel	2
,, dipyrena, *Wall.*	...	7,000—9,000	$\frac{30-40}{15-20+3-4}$	...	E	...	10 to 1	Common about Senchal; and in some places heavily grazed it is the only tree.	2
Celastrineæ.									
Euonymus theæfolius, *Wall.*	...	5,000—6,000	...	...		3 to 4	2	Not uncommon	3
,, echinatus, *Wall.* ...	...	7,000—10,000	...	...	...	5	8	Sometimes thickly covering trees, sending out numerous adventitious roots.	3
Celastrus stylosa, *Wall.* ...	...	5,000—6,000	...	...	...	4 to 5	11 to 12	Rambling and climbing. Common .	5
Rhamneæ.									
Rhamnus dahuricus, *Pall.* ...	...	4,000—9,500	$\frac{10-20}{0-5+1-2}$	...	E	...	2	Lower elevations in Goompahar Range ..	3
Berchemia floribunda, *Wall.*	Chisduk ..	4,000—6,000	...	...	...	12	3	Young leaves poisonous to cattle	3
Ampelideæ.									
Vitis himalayana, *Brand.*	Chercheri ...	6,000—11,000	...	...	D	5 to 6	9	A very large climber Good fodder	3§
,, capriolata, *Don.*	Pani lahra .	4,000—7,000	...	...	E	5	10	Very common. Slender ...	3
,, rumicisperma, *Lawe.*	Chercheri ...	3,000—7,000	...	...	D	5	9	Very common and perhaps the largest. Fruit sweet.	3§
Sapindaceæ.									
Acer sikkimense, *Miq.*	Lal—or Lahra kabashi.	6,000—9,000	$\frac{20-30}{15-20+2-3}$	10 to 15	D	4 to 5	6 to 7	Generally epiphytic	2
,, Hookeri, *Miq*	Lal kabashi ...	8,000—10,000	$\frac{30-50}{15-20+3-4}$	8	D	...	...	Abundant on Senchal	1
,, lævigatum, *Wall.*	Pooteli ...	5,000—9,000	$\frac{60-80}{40-60+8-12}$	8 to 12	D	3 to 4	5 to 6	Occasionally used for house planking and tea boxes.	1
,, villosum, *Wall.*	Molo kabashi ..	5,000—6,500	$\frac{30-40}{15-20+2-3}$	16	D	8 to 10	10 to 4	Generally over scrub growth	2
,, Campbellii, *Hook. f. & Thoms.*	Kabashi ...	7,000—10,000	$\frac{80-100}{40-60+10-15}$	8 to 15	D	4 to 5	9 to 10	Used for planking, but apt to split. Regenerates abundantly by seed, especially in the open or under light cover. Coppices	1
Turpinia pomifera, *DC.*	Thali ...	3,000—7,000	$\frac{30-40}{15-20+3-4}$	...	E	3 to 4	11 to 12	Very abundant in undergrowth. Used for fuel and leaves as a fodder.	2
Sabiaceæ.									
Meliosma, dilleniæfolia, *Wall.* ...	Lasuni ..	Up to 6,000	$\frac{50-60}{30-40+4-6}$	...	E	...	11 to 12	A straight growing tree, sometimes cut for scantling, and yielding a colourless resin Below 5,000 feet Dysoxylum binectarium is found associated with it, and is also called Lasuni	...
,, Wallichii, *Planch.* ...	Dabdabi ...	5,000—7,500	$\frac{70-80}{40-60+7-12}$	8 to 10	D	6 to 9	...	Used for box planking	1
Sabia leptandra, *Hook. f. & Th.* ..	...	5,000—7,500	...	...	D	3	12	Scrambling and climbing	3
Anacardiaceæ.									
Rhus semi-alata, *Murray*	Bhakiamilo ...	3,000—6,000	$\frac{20-30}{10-15+2-3}$	2 to 3	D	9 to 10	10 to 11	In open forest. Wood said to be valued for gunpowder in Nepal. Fruit eaten.	2
,, insignis, *Hook. f.*	Kagbhalay ...	3,000—7,000	$\frac{20-30}{10-12+1-3}$	3 to 4	D	11 to 12	11 to 12	Generally epiphytic, except in open and rocky places Juice causes blisters. Flowers on the fall of the leaves, and the fruit takes one year to ripen. Flowers have only been noticed on the topmost branches of epiphytic individuals.	2
,, succedanea, *Linn.*	Kanibhalay ...	5,000—8,000	$\frac{16-20}{5-10+1-2}$	...	D	5	10	On rocky ground, occasionally epiphytic. An ornamental tree of little value.	2
Drimycarpus racemosus, *Hk. f.* ..	...	Up to 6,000	$\frac{40-60}{10-20+4-6}$	...	E	3	11 to 12	Common in Takdak forest near lower boundary	...
Leguminosæ.									
Erythrina arborescens, *Roxb.* ...	Phalida ...	Up to 7,000	$\frac{20-30}{10-15+2-3}$	6	D	6 to 7	11 to 12	Second growth forest, scarce. Reproduces very readily from cuttings.	2
Mucuna macrocarpa, *Wall.* ...	Baldengra ...	1,000—7,000	...	...	E	4 to 5	8	Attains 3—4 foot girth Very troublesome in young growth A fodder	3§
Rosaceæ.									
Prunus nepalensis, *Ser.*	Arupati ...	5,000—9,000	$\frac{70-80}{40-60+6-8}$	Very variable.	D	4	11	Wood handsome but seldom used	1
,, Puddum, *Roxb.*	Paiyon ...	5,000—7,000	$\frac{70-80}{40-60+5-7}$	Variable.	D	3	...	Not common, except in Sepoydhura block	1
,, acuminata, *Wall.* ...	Lâli ..	5,000—7,000	$\frac{30-40}{15-15+2-4}$	...	E	10 to 11	12 to 2	Used for fuel. Lopped for fodder	2
Eriobotrya petiolata, *Hook. f.* ..	Mya ...	5,000—9,000	$\frac{30-60}{20-30+4-5}$	8 to 10	E	4	7	Growth straight, but only used for fuel ...	1

* Trees usually forming the upper storey in these forests ... 1
Trees not usually found in the upper storey 2
Shrubs or woody climbers 3
Large injurious climbers ... ... 3§

APPENDIX II—*continued.*

THE FLORA—*continued.*

Classified List of the more important Plants found in the Darjeeling Forests—continued.

Scientific name.	Native name.	Elevation.	Formula.	Number of rings per inch of radius.	Deciduous or evergreen.	Time of— Flowering.	Time of— Fruiting.	Remarks.	Habit.*
Rosaceæ—concluded.		Feet.				Month.	Month.		
Neillia thyrsiflora, *Don.*	...	5,000—8,000	...	...	E	5	6	In open rocky places, common	3
Rubus calycinus, *Wall.*	...	6,000—9,000	...	...	E	4 to 5	7 to 6	A ground shrub, very common	3
,, moluccanus, *Linn.*	Lal aselu ...	3,000—8,000	...	...	bD	7	7 to 8	Very common, and in open places much encumbering the ground.	3
,, Thomsoni, *Focke.*	Bhutia aselu .	8,000—11,000	...	...	...	8 to 9	9 to 10	Very common on Senchal, forming dense low thickets.	3
,, lineatus, *Reinw.*	Gempe aselu...	6,000—9,000	...	...	D	8 to 9	10 to 11	Very common in cleared spaces, greatly obstructing natural regeneration.	3
,, ellipticus, *Smith.*	Tulu aselu ...	4,000—7,000	...	...	E	3	4 to 5	Very common, especially on old cultivated lands.	3
,, lasiocarpus, *Smith.*	...	4,000—10,000	...	...	E	4 to 5	7 to 8	Common, tall, eglandular	3
,, rosæfolius, *Smith.*		4,000—7,000	...	...	...	4	6 to 7	Common, tall, glandular	3
,, acuminatus, *Sm.*	Sanu aselu	4,000—7,000	...	...	...	7	...	Common, scrambling	3
,, paniculatus, *Sm.*	Aselu ...	6,000—8,000	...	...	...	7	...	Very common, climbing over high trees ...	3
Saxifragaceæ.									
Hydrangea robusta, *H. f. & T.* ...	Bogoti .	5,000—8,000	$\frac{15-25}{0-10+1-2}$	8 to 9	D	9	12 to 1	Especially in jhoras	3
Dichroa febrifuga, *Lour.*	Básak	5,000—8,000	$\frac{6-12}{0+3''-10'}$	...	E	7 to 8	10 to 1	Very common, both under cover and in open, especially about 6,000 feet.	3
Hamamelideæ.									
Bucklandia populnea, *Br.*	Pipli	5,000—7,500	$\frac{60-80}{30-40+10-15}$	6 to 7	E	2 to 3	...	Chiefly on northern slopes; much valued for buildings. Regenerates well on steep slopes and landslips.	1
Myrtaceæ.									
Eugenia Wallichii, *Wight.* (?) ...	Chumlani, Kiamoni.	4,000—6,000	$\frac{60-80}{30-40+4-8}$	...	E	...	9 to 10	Common in Sepoydhura block. Used occasionally for building. Leaves very large, dark green.	1
,, Kurzii *Duthie.*	Jamun, Amboki.	Up to 6,000	$\frac{40-60}{30-40+\frac{1}{2}-6}$	...	E	10	3	Fairly common	1
Melastomaceæ.									
Osbeckia crinita, *Benth.*	...	4,000—8,000	...	...	D	9 to 10	12	Very common at lower elevations in open places, banks, etc. Height 4—8 feet	3
Medinilla himalayana, *Hook. f.* ...	...	3,000—6,000	...	...	E	10	1 to 2	A common epiphyte	3
Samydaceæ.									
Casearia glomerata, *Roxb.* ...	Barkholi ...	3,000—6,500	$\frac{60-80}{30-50+6-8}$	10	E	4	7 to 8	Especially in second-growth forest, but also common in high forest. Growth very straight. Used for planking and makes a good charcoal.	1
Cucurbitaceæ.									
Herpetospermum caudigerum, *Wall.*	...	...	...	...	...	7 to 9	...	An extensive creeper over low bushes and often injuring young plants. Flowers yellow.	4
Umbelliferæ.									
Hydrocotyle javanica. *Thunb.* ...	...	...	...	...	...	7 to 2	...	Often forming a carpet in damp rather open places.	4
Œnanthe Thomsoni, *C. B. Clarke...*	...	...	...	...	...	8 to 9	...	Often matted in wet places or where water stands during the rains. Probably poisonous.	4
Araliaceæ.									
Heptapleurum impressum, *C. B. Clarke.*	Balu Chindia	6,000—11,000	$\frac{30-50}{15-25+3-4}$	...	E	9	...	Abundant. Used for firewood and fodder ...	3
Heptapleurum venulosum, *Seem.*..	...	Up to 6,000	...	...		2	...	A large climber, common at lowe elevations ...	3
Brassaiopsis hispida, *Seem.* ...	Phuta ...	...	$\frac{10-15}{5-10+\frac{1}{2}-1}$	...	E	2	9 to 10	Leaves used for fodder; unimportant; unfit for firewood; common.	3
,, mitis, *C. B. Clarke.* ..	Chuletroo, Phuta.	4,000—8,000	$\frac{20-30}{10-20+1-2}$	5	E	7 to 8	1 to 2	Very common, especially in jhoras. The most important of the Araliaceous fodders.	2
,, speciosa, *Done.* ...	Chindia, Phuta	5,000—7,000	$\frac{10-20}{5-12+\frac{1}{2}-1}$	5	E	2 to 3	3 to 4	Very common, unimportant except for foddor	2
,, Hookeri, *C. B. Clarke*	Chindia, Phuta	2,000—7,000	$\frac{15-25}{10-20+\frac{1}{2}-1}$	...	E	2 to 3	3 to 4	Resembling the last, but stouter. Sometimes used for fodder.	2
Macropanax oreophilum, *Miq.* ...	Chindia ...	5,000—7,000	$\frac{30-50}{15-25+4-5}$	6	E	8 to 9	10	Very common at lower elevations. Used for firewood.	2
Helwingia himalaica, *Hk. f. & T.*	...	7,000—9,000	...	...	E	5	7	Very common, a branching under-shrub, chiefly on ridges.	3
Pentapanax racemosum, *Seem.* ...	...	6,000—8,000	...	...	...	5 to 7	8	Common, a very large climber	3
,, Leschenaultii, *Seem.*...	...	6,000—10,000	...	...	...	5 to 6	...	Not so large as P. racemosum, and less common	3
Cornaceæ.									
Marlea begoniæfolia, *Roxb.* ...	...	1,000—9,000	$\frac{20-30}{10-15+2-3}$	5	...	5 to 6	8	Common. A variety with almost entire leaves is common on Senchal.	2
Nyssa sessiliflora, *Hook. f.* ...	Chilauni ..	5,000—8,000	$\frac{60-80}{20-30+6-8}$	10	SD	...	4 to 5	Grows straight, and is used rather largely for buildings.	1
Cornus capitata *Wall.*	Aret ..	6,000—8,000	$\frac{40-60}{20-30+4-5}$	16	D	5	7	Rare. Samples have been sent to Ishapur to be tried for gunpowder.	2
,, macrophylla, *Wall.* ..	Phusri, Balu sisi	4,000—6,000	$\frac{30-40}{20-25+2-3}$	8 to 9	L	4 to 5	...	Not uncommon at lower elevations	2
Aucuba himalaica, *Hook. f. & T.*.	...	6,000—9,000	$\frac{10-20}{0-6+1-2}$	20	E	4 to 5	2 to 3	Very common under shad	3

* { Trees usually forming the upper storey in these forests ... 1
Trees not usually found in the upper storey 2
Shrubs or woody climbers 3
Herbs or herbaceous climbers 4

APPENDIX II—*continued.*

THE FLORA—*continued.*

Classified List of the more important Plants found in the Darjeeling Forests—continued.

Scientific name.	Native name.	Elevation.	Formula.	Number of rings per inch of radius.	Deciduous or evergreen.	Time of— Flowering.	Time of— Fruiting.	Remarks.	Habit.*
Caprifoliaceæ.		Feet.				Month.	Month.		
Viburnum coriaceum, *Blume.* ...	Bara gorakuri	4,000—8,000	...	...	D	8	..	Common in Rangnu block	3
,, erubescens, *Wall.* ...	Asari ..	5,000—10,000	$\frac{10-20}{2-5+1-2}$	10 to 12	D	4 to 5	7 to 9	Very common. Abundant in second-growth forest. Grows readily from cuttings.	3, 2
,, stellulatum, *Wall.* ...	Gorakuri ..	6,000—11,000	...	...	D	7	...	On Senchal	3
Sambucus javanica, *Blume.* ..	Bagboki ..	About 7,000	$\frac{10-20}{0+1-2}$	...	D	8 to 9	...	Common	3
Pentapyxis stipulata, *Hook. f.* ...	Berikuru ...	6,000—10,000	...	...	...	4	6	Sunny places. Common	3
Lonicera glabrata, *Wall.*	Ret-lahra ...	4,000—8,000	...	...	...	8 to 9	11	Common	3
Rubiaceæ.									
Morinda angustifolia, *Roxb.* ..	Amboki ...	About 6,000	$\frac{10-20}{2-5+1-2}$	...	E	11	...	.....	3, 2
Hymenopogon parasiticus, *Wall.* .	..	6,000—8,000	...	...	...	6 to 8	11	A straggling common epiphyte	3
Mussænda frondosa, *Linn.* ..	Dhobinephul	2,000—6,000	...	...	.	8	...	Common in jhoras in second-growth forest	3
Paychotria erratica, *Hook f.* ...	...	4,000—6,000	...	...	...	6 to 7	11	Common under shade	4
Lasianthus Biermanni, *King* ...	...	5,000—8,000	...	...	..	3 to 4	8 to 9	Ditto ditto .	3
Ophiorrhiza Treutleri, *Hook f.* ...	...	..	...	...	...	5 to 6	8 to 9	Often exceedingly thick under shade in high forest.	4
,, nutans, *C. B. Clarke*	.	...	...	...	...	6	...	In similar localities. Stem creeping ...	4
Rubia cordifolia, *Linn.*	Manjista ...	up to 8,000	...	...	...	7	7 to 8	Scrambling in open places. Collected for the red dye (madder) it yields.	4
Compositæ.									
Artemisia vulgaris, *Linn.*	Titepat ...	5,000—8,000	...	...	...	6 to 10	...	Often forming dense thickets 6-8 feet high on old cultivated ground.	3
Carpesium cernuum, *Linn.* ...	...	up to 13,000	...	...	..	4	11 to 1	An annual weed 12 to 24" high, very common in grassy places and noticeable from its very sticky fruits.	4
Anaphalis cinnamomea, *Clarke.* ...	Rukiphul ...	5,000—10,000	...	...	...	5 to 12	...	1-2 feet often growing very thickly in grassy open places with Potentilla fulgens and Carpesium.	
Gnaphalium luteo-album, *Linn.* ..	...	Up to 10,000	...	...	...	10 to 1	...	In damper localities than the last	4
Inula nervosa, *Wall.*	...	4,000 to 7,000	...	...	...	10 to 12	...	Tall, common in open ground	4
Gynura angulosa, *DC.*	...	4,000—7,000	...	...	...	10 to 12	12 to 1	Tall, succulent. Very common in light places in damp localities.	4
Senecio arancosus, *DC.*	...	5,000—7,000	...	...	...	1 to 2	3	An extensive herbaceous climber ...	4
Ainsliæa pteropoda, *DC.*		5,000—8,000	...	...	...	4 to 5	6	Very characteristic of tall high forest and airly clear ground.	4
Campanulaceæ.									
Campanumea inflata, *Clarke.* ..	...	5,000—8,000	...	...	...	9	2 to 3	Climbing, common, stinking	4
Pratia begonifolia, *Lindl.* ..		2,000—7 000	..	...	...	7 to 8	7 to 8	Extensively creeping in damp places and over rocks.	4
,, montana, *Hasak.* ...	...	4 000—8,000	...	...	...		3	Erect Fairly in damp and shady places ...	4
Lobelia pyramidalis, *Wall.* ...	...	3,000—9,000	...	...	...	4 to 5	...	In similar localities	4
Vaccinaceæ.									
Pentapterygium serpens, *Klotzsch.*	Kali hurchu ..	3,000—8,000	...	...	...	3	...	A generally epiphytic shrub with a tuberous root. Flowers crimson.	3
,, Hookeri, *Clarke.*	...	5,000—8,000	...	...	...	7	...	Less common. Habit similar. Flowers yellow.	3
Vaccinium nummularia, *H. f. & T.*	.	7,000	...	...	..	...	...	A small, rigid, generally epiphytic shrub. Very common along the Old Military Road	
,, retusum, *H. f.* ..	..	7,000—9,000	...	...	...	...	...	Common—As small epiphyte with pendant branches.	...
,, serratum, *Wight.* ...	..	3,000—7,000	...	..		4 to 5	..	A stout epiphyte Root tuberous, poisonous	3
Ericaceæ.									
Pieris ovalifolia, *D. Don.*	Angeri ..	3,000—8,000	$\frac{15-20}{5-15+2-3}$	6 12	D	6 to 7	11 to 12	Frequent about Senchal in jhoras. A decoction of the young leaves is a valuable cure for mange in horses.	2
Rhododendron grande, *Wight,* .	Chimal ..	7,000—11,000	$\frac{30-50}{10-20+3-6}$	20 0	E	3 to 4	10	Only important at high elevations as on Senchal-Chattakpur ridge.	1
,, arboreum, *Sm.* ...	Lal Garans ..	5,000—10,000	$\frac{20-30}{5-15+3-5}$	20 30	E	3 to 4	10	Similar localities	2
,, vaccinioides, *Hook. f.* ..	...	6,000—8,000	...	..	...	6 to 7	...	Often epiphytic. Small	3
,, Dalhousiæ, *Hook. f.* ..	...	6,000—9,000	...	...	...	3 to 4	...	A lax shrub, often epiphytic	3
Monotropeæ.			...						
Monotropa uniflora, *Linn.*	...	6,000—8,000	.	...	...	7	...	A colourless parasite on the roots of jhingni, oak, and other trees.	4
Myrsineæ.									
Myrsine semiserrata, *Wall.* ...	Phalami	3,000—8,000	$\frac{10-30}{5-15+3-4}$	...	...	2 to 3	4 to 2	Very common, sometimes only a crooked shrub. Wood used for axe and hoe handles.	3, 2
Maesa indica, *Wall.*	Bilauni ...	Up to 6,000	$\frac{4-20}{0-4+1-2}$	8 10	...	4 to 7	...	Often forming a dense growth on lands gone out of cultivation; and common elsewhere.	3
Ardisia macrocarpa, *Wall.* ...	Dumaiphal ..	3,000—7,000	...	...	..	6 to 7	11 to 12	A small shrub with scarlet berries, common under shade.	3
Embelia floribunda, *Wall.*	Himalcheri ..	2,000—7,000	...	.	...	12	9 to 10	A scandent shrub, with drooping branches and white panicles of flowers. Common.	3
,, Gamblei, *Kurz.*	Amili lahra	6,000—9,000	...	...	...	7 to 8	2	One of the worst creepers about Goompahar; very large, with pendulous branches.	3½
Nagushia, *Don.*	Amilpati ...	5,000—10,000	.	...	...	...	...	Very large Drupes and leaves eaten by the Paharias.	3½

* Trees usually forming the upper storey in these forests ... 1
Trees not usually found in the upper storey 2
Shrubs or woody climbers 3
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Herbs or herbaceous climbers 4

APPENDIX II—*continued.*

THE FLORA—*continued.*

Classified List of the more important Plants found in the Darjeeling Forests—continued.

Scientific name.	Native name.	Elevation.	Formula.	Number of rings per inch of radius.	Deciduous or evergreen.	Time of— Flowering.	Time of— Fruiting.	Remarks.	Habit.*
Styracea.		Feet.							
Symplocos theæfolia, *Ham.* ...	Kharani, khoime.	5,000—8,000	$\frac{30-40}{25-30+3-4}$	6 to 9	E	5	1 to 2	Extremely common, sometimes gregarious, in second-growth forest, and as a lower storey in high forest; often to the exclusion of more valuable light-demanding species. Scantlings are occasionally cut from large trees. It is a bad fuel.	2
,, ramosissima, *Wall.* ...	Kharani ...	4,000—8,000	$\frac{30-40}{15-20+3-4}$	6 to 9	E	5 to 6	2 to 3	Very common, but not so gregarious as *S. theæfolia.* More slender and cover less dense.	2
,, glomerata, *King.*	Kholme ...	1,000—2,000	$\frac{10-20}{5-15+1-2}$	9 to 10	E	3	10 to 11	Wood harder and stronger than the other two species. Tree unimportant.	2
Styrax serrulatum, *Roxb.*	Hingua, harré	3,000—7,000	$\frac{20-30}{10-15+1-2}$	...	E	5	7 to 8	Frequent	2
Oleaceæ.									
Osmanthus fragrans, *Lour.* ...	Sitinga ...	4,000—7,000	$\frac{20-30}{10-15+1-2}$	...	E	10 to 11	4 to 5	Frequent at lower elevations in Goompahar Range.	2
Jasminum dispermum, *Wall.* ...	..	2,000—8,000	...	...	...	4 to 5	12	Common	3
Gentianaceæ.									
Crawfurdia japonica, *Sieb.*	...	About 7,000	...	...	...	2	2	A common small twiner	4
Swertia dilatata, *Clarke.*	Chiretta ...	4,000—12,000	...	...	...	...	1 to 2	Common in open places, especially on Senchal. Said to be occasionally used medicinally.	4
,, bimaculata, *H. f. & T.* ...	Ditto ...	5,000—8,000	...	...	...	7 to 11	...	Very common, especially in fairly open places. Not touched by cattle. Occasionally used medicinally.	4
,, Chirata, *Ham.*	Ditto ...	4,000—10,000	...	...	...	...	...	The true "chiretta," but not so common as the above two species, and only found scattered. A valuable medicine.	4
Boraginea.									
Ehretia Wallichiana, *H. f. & T.* ...	Boeri ...	3,000—7,000	$\frac{20-40}{15-20+3-4}$	7	D	4 to 5	5 to 10	Frequent, especially in second-growth forest. Occasionally used for scantling. Coppices.	2
Convolulaceæ.									
Porana grandiflora, *Wall.*	...	5,000—8,000	...	...	...	8	...	A large slender climber with mauve flowers ...	3
Solanaceæ.									
Solanum macrodon, *Wall.*	...	4,000—8,000	...	..	...	7	8	A very common small shrub	3
Scrophularineæ.									
Wightia gigantea, *Wall.*	Lakori ...	3,000—7,000	...	...	D	10	...	A large epiphytic tree, often 3'—4' girth. Wood used for carving.	2
Gesneraceæ.									
Æschynanthus maculata, *Lindl.* ..	...	2,000—7,000	...	...	...	6	...	A common epiphytic shrub with fleshy leaves	3
Acanthaceæ.									
Strobilanthes pectinatus, *T. Ander.*	Kibu, P., Pusum, hamna, Bh.	6,000—7,500	$\frac{10-14}{0+6''-1'}$	...	...	7 to 10	10 to 12	Often forming a dense undergrowth in high forest, interfering with natural regeneration. The natives state that it flowers at intervals of 5—7 years. A few plants flowered in 1889, and flowering became general in 1890. The plants have all died since ripening their fruits. Flowers purple and white. A fodder.	3
,, petiolaris, *Nees.* ...	Kibu, P., Piomam, Bh.	3,000—10,000	...	...	...	3 to 4	...	Not gregarious. A large (when in flower) paniculately branched shrub, 6 feet. Leaves sometimes spotted. Flowers lilac.	3
,, pentstemonoides, *T. Ander.*	Kibu.	1,000—6,000	...	...	...	6 to 7	...	Much-branched shrub. Flowers pale purple ...	3
,, divaricatus, *T. Ander.*	Lal Kibu, P., Ralham, Bh.	5,000—9,000	...	...	...	9	11 to 12	A very common shrub, 2-5 feet with much-branched slender branches. Flowers dark purple. The best fodder of the genus.	3
,, inflatus, *T. Ander.* ...	Kibu ...	5,000—8,000	...	...	...	7	...	Somewhat resembling *S. pectinatus* in its woody branches and leaves, but inflorescence in flexuous, 1-sided spikes. Common.	3
,, Wallichii, *Nees.* ..	...	7,000—11,000	...	...	..	9	...	Somewhat resembling *S. divaricatus* in habit. Flowers blue.	3
Thunbergia lutea. *T. Anaer.* ...	...	4,000—7,000	.....	...	...	7 to 8	...	A slender twiner. Common. Flowers yellow	4
,, coccinea, *Wall.* ...	...	2,000—7,000	.....	...	...	7 to 8	...	A large climber with pendant branches. Flowers crimson and scarlet.	3
Verbenaceæ.									
Premna interrupta, *Wall.* ...	...	5,000—8,000	.....	...	D	7 to 8	...	A large climber, occasionally self-supporting. Common.	3½
Labiatæ.									
Leucosceptrum canum, *Sm.*	Gurpis .	2,000—8,000	$\frac{20-30}{0-10+1-3}$	3 to 5	E	2	8 to 9	Sometimes almost pure in second-growth forest. Used for firewood.	2
Elsholtzia pilosa, *Benth.* ...	} .	...	...	...	...	10 to 11	12 to 1	Annual herbs, smelling strongly of camphor. Very abundant in sunny places.	4
,, strobilifera, *Benth.*	}								
,, cristata, *Willd.* ..	...	...	...	...	...	10 to 11	...	Taller. In shady places	4
Notochæte hamosa, *Benth.* ...	...	...	...	...	...	10 to 10	11	In rather open places. The cluster of hooked fruits clings to clothes. Its seeds are also distributed by cattle.	...

* Trees usually forming in the upper storey in these forests ...
Trees not usually found in the upper storey 2
Shrubs or woody climbers 3
Large injurious climbers 3½
Herbs or herbaceous climbers ... ...

APPENDIX II—*continued.*

THE FLORA—*continued.*

Classified List of the more important Plants found in the Darjeeling Forests—continued.

Scientific name.	Native name.	Elevation.	Formula.	Number of rings per inch of radius.	Deciduous or evergreen.	Time of— Flowering.	Time of— Fruiting	Remarks.	Habit.*
Amarantaceæ.		Feet.				Month	Month.		
Stilbanthus scandens, *Hook f.* ...		5,000—7,000	...	...	...	6 to 9	...	A very large woody climber, and very common in moist places, as a scrambling shrub in the under growth.	2½
Achyranthes bidentata, *Blume.* ...	...	.....	..	...	..	7 to 9	8 to 10	A very common annual herb in shade. The spines on the fruits pierce the skin.	4
Polygonaceæ.									
Polygonum molle, *Don.* ...	Totni ..	5,000—7,000	...	..	...	9 to 10	..	Often forming a dense growth in open ground, and difficult to eradicate Young shoots acid, eaten.	3
,, paniculatum, *Blume.*	Do. .	7,000—8,000	...	...	...	9 to 10	.	A tall climber with numerous flexuous drooping branches.	3
,, chinense, *Linn.* ...	...	4,000—8,000	...	...	...	8 to 12	3	A common rambling or climbing shrub forming a network over low bushes.	3
,, Hydropiper, *Linn.* ...	...	—7,000	...	...	..	8	...	In wet places	4
,, alatum, *Ham.* .	...	—10,000	...	.	...	5 to 7	...	Very common on sides on of roads in open places etc	4
,, runcinatum, *Ham.* ...	...	7,000—10,00	...	...	...	8	...	In similar localities	4
Rumex nepalensis, *Spreng.*	..	4,000—9,000	...	...		..	...	Is common round bathan sites ...	4
Piperaceæ.									
Piper nepalensis, *Spreng.* ..	...	About 6,000	...	...	...	2 to 3	4	Very common, epiphytic or climbing, with stems, 6" to 9" girth	4—3
Peperomia reflexa, *A. Dietr.* ...	...	About 7,000	...	...	...	6	...	Small, very common on trees or rocks .	4
Laurineæ.									
Beilschmiedia sikkimensis, *King*....	Tarsing ..	5,000—6,500	$\frac{60-80}{40-50+6-9}$	5 to 9	E	5 to 9	6 to 7	Growth straight; used for building, box planking, etc.	1
Machilus odoratissima, *Nees.* ...	Kawla, Lali ..	5,000—8,000	$\frac{30-100}{30-40+8-12}$	Variable Average, 7	E	5	10	Very hardy and natural reproduction under cover usually very good. Used for building and box planking, but shrinks and warps badly. Kawla has not fruited this year (1891) There appear to be several species of Machilus, all called "kawla" by the natives	1
Actinodaphne sikkimensis, *Meisn.*	Angaria	5,000—6,500	$\frac{60-90}{40-30+6-9}$	5 to 15	E	...	...	A very good wood for tea-box planking. Tree not very common.	1
Phœbe attenuata, *Nees,* ..	Lepcha kawla	4,000—7,000	$\frac{80-100}{30-40+8-12}$	5 to 9	E	5	10 to 1	Growth straight, used for planking Natural and coppice reproduction very good.	1
Litsæa elongata, *Wall.*	Thulo Paleli ,	6,000—8,000	$\frac{40-60}{20-30+4-6}$	10 to 20	E	9 to 10	5 to 6	Common. Wood used for building . NOTE.—Among large trees *L. elongata*, as described in Hooker's *Flora*, includes two well-marked varieties. They are easily distinguished as follows — (1). Leaves coriaceous, quite glabrous above, acute to caudate, acuminate, lanceolate; 1" broad. New leaves appear in November Leaf-buds very long, 1—1½". Somewhat resembles "kawla." (2) Leaves less coriaceous, when young very soft and pubescent, nearly glabrous when old, elliptic, oblanceolate or obvate, acute not acuminate, 1½—3½" broad New leaves appear in October. Leaf-buds under 1" long. A very handsome tree, not at all with the appearance of "kawla."	2, 1
,, oblonga, *Wall.* (*Var.*) ...	Kali Paleli ..	About 6,500	$\frac{40-60}{20-30+4-6}$	...	E	3	12	Fairly common. A straight-growing tree which might be useful for scantling.	
,, citrata, *Blume.*	Siltimur ..	5,000—9,000	$\frac{20-30}{15-20+1-2}$	3 to 6	D or E	12	7	Very common, especially in second-growth forest at 6—7,000 feet. Leaves do not begin to fall till March and it is never entirely bare	
,, Kingii, *Hook. f.*	Do. ...	7,000—8,000	$\frac{10-15}{0-5+6-1}$		D	3 to 4	8	Very common about Senchal. Deciduous from December to March.	
Lindera pulcherrima, *Benth.* ...	Sisi, Sisiphal	4,000—9,000	$\frac{60-80}{20-30+4-7}$	4 to 12	E	5	9 to 10	Used for building. The tree has a habit of sending up a number of large and small stems from the same root. Coppices freely	1
,, assamica, *Kurs.* . ..	Sanu Paleli ..	6,000—9,000	$\frac{10-30}{5-15+1-3}$	...	E	10 to 11	12	Very common, especially at higher elevations Very shade-bearing	
Cinnamomum Tamala, *Fr. Nees.* ...	Sisi	3,000—7,800	$\frac{30-40}{10-20+3-4}$	6	E	3 to 4	7 to 8	Common on ridges below 7,000. Used for firewood and leaves a spice (Tezpat). Habit of *Lindera pulcherrima.*	1
,, obtusifolium, *Nees.*	Sinkoli ..	1,000—7,000	$\frac{40-50}{10-20+3-6}$	10 to 12	E	...	11 to 12	More frequent, and at lower elevations than *C. Tamala* Used for firewood. Seedlings often met with in second-growth forest.	2
Proteaceæ.									
Helicia erratica, *Hook. f.* ...	Bandri ...	2,000—6,000	$\frac{10-20}{5-8+1-2}$	.	E	8	...	Wood said to be strong and to make a good charcoal.	
Thymelæaceæ.									
Daphne cannabina, *Wall.* ..	Kaguti ..	5,000—8,000	...	9	E	11 to 2	3 to 5	A very common shrub, especially on the Takdah range. Used with the next in manufacturing Nepal paper.	3
,, involucrata, *Wall,* ..	Kaguti, Setibarwal.	About 6,000	...		E	12	...	Less common	3
Loranthaceæ.									
Loranthus longiflorus, *Desrouss*	Ajeru ...	3,000—7,500				5 to 6	...	Very large, parasitic shrub. Very common on a variety of trees.	3
Viscum articulatum, *Burm.*	Hurchu	About 7,000	...	...	...	..		Fairly common parasitic shrub	3
Santalaceæ.									
Pyrularia edulis *A. DC.* ..	Amphi	4,000—6,500	$\frac{20-30}{5-10+2-3}$	8	D	4 to 5	11 to 12	Common wood hard said to be used for dairy utensils by Bhutias.	

* { Trees usually forming in the upper storey in these forests . 1
Trees not usually found in the upper storey 2
Shrubs or woody climbers 3
Large injurious climbers 3½
Herbs or herbaceous climbers 4

APPENDIX II—*continued.*

THE FLORA—*continued.*

Classified List of the more important Plants found in the Darjeeling Forests—continued.

Scientific name.	Native name.	Elevation.	Formula.	Number of rings per inch of radius.	Deciduous or evergreen.	Time of— Flowering.	Time of— Fruiting.	Remarks.	Habit.*
Euphorbiaceæ.		Feet.				Month.	Month.		
Glochidion acuminatum, *Muell.* ..	Latikat ...	5,000—7,000	$\frac{40-50}{10-20+3-4}$	8	D	6	9	Common, especially in second-growth forest ...	2
Mallotus nepalensis, *Muell.* ...	Phusri mallata	5,000—7,500	$\frac{20-30}{10-15+1-2}$	5	D	7	9	Used for cooly huts and fencing. Both this and Macaranga form a light but firm and good charcoal.	2
Macaranga denticulata, *Muell.* ...	Mallata ...	3,000—6,000	$\frac{40-60}{20-30+3-6}$	2 to 3	E	10 to 11	5 to 6	Often forming nearly pure forest on old cultivated ground. Shade light. Use as for Mallotus, also for rough shingles for batháns and occasionally for planks.	1
Urticaceæ.									
Ficus nemoralis, *Wall.*	Dudhila ...	2,000—8,000	$\frac{30-50}{10-20+3-4}$	...	E	...	6 to 10	Wood only used for fuel. Branches lopped for fodder.	2
,, fovcolata, *Wall.*	Dudhila lahra	2,000—7,000	...	...	...	...	...	A large climber and good fodder. Common ...	3
,, Roxburghii, *Wall.*	Nebari ...	Up to 6,000	$\frac{30-40}{10-20+3-4}$	...	E	...	7	Common in second-growth forest. Leaves cut for fodder.	2
Debregeasia velutina, *Gand.* ...	Toushiari ...	3,000—7,000	$\frac{15-20}{0-3+6''-1'}$	4 to 5	E	8 to 9	2 to 3	Common, especially in stony situations. A fodder for cattle and ponies.	2
Bœhmeria platyphylla, *Don.* ...	...	About 7,000	..	...	D	5	...	A stout, light-demanding shrub. Yields a fibre	3
Pouzolzia viminea, *Wedd.* ...	Chipali ...	About 7 000	...	...	...	7	...	Very common, often forming a tangled undergrowth in open forest.	3
Girardinia heterophylla, *Don.* ...	Ullo, Sisnu ...	...	...	...	D	7 to 8	...	4-6 feet high, stinging. Very common. Fibre used for making a strong cloth.	3—4
Pilea umbrosa, *Wedd.*	...	4,000-9,000	...	...	...	7 to 8	...	Common herbaceous plant under shade ...	4
,, scripta *Wedd.*	.	3,500—6,000	...	..	...	7 to 8	...	Stout succulent herb, 2—4 feet. Frequent in ravines under shade.	4
Elatostema fcoides, *Wedd.*	Gaglata ...	4,000—8,000	...	...	...	7	...	Tall, 3—4 feet. Stem grooved. Common in ravines.	4
,, lineolatum, *Wight.* ...	Do. ...	5,000—6,000	...	...	...	6 to 8	...	The commonest, 1—2 feet branched. Stands more light and exposure than most of the other species.	4
,, platyphyllum, *Wedd.* ...	Do. ...	1,000—6,000	...	...	...	7	...	The largest 4—5 feet. Generally in ravines ...	4
,, obtusum, *Wedd.*	Do. ...	7,000—10,000	...	...	...	...	...	1 to 2 feet. Leaves pale beneath	4

Besides the above, there are a number of smaller species also common, *e.g.* E. subincisum, *Wedd.*, E. dissectum, *Wedd.*, C. surculosum, *Wight.* They are all eaten in small quantities by cattle, and the genus is very characteristic of the herbaceous undergrowth in nearly all high forests.

Juglandeæ.									
Juglans regia, *Linn.*	Akhrot ...	3,000—10,000	$\frac{60-100}{30-40+8-12}$	6	D	3 to 4	10 to 11	Very rare, having been cut out. Plantations have been made at Rangbul and Rangirum.	1
Engelhardtia spicata, *Blume.* ...	Mowa ...	About 6,000	$\frac{60-100}{30-50+8-12}$	5	S D	9 to 10	2 to 3	Used for planking. Coppices freely	1
Cupuliferæ.									
Betula alnoides, *Ham.*	Sauer ...	5,000—10,000	$\frac{80-100}{40-60+6-8}$	6	D	...	...	*N.B.*—This includes B cylindrostachys, *Wall.*, and B acuminata, *Wall.* The two species should be kept distinct. B. cylindrostachys is a large tree of the lower hills, used for building and a good firewood; B. acuminata has a formula $\frac{30-40}{20-30+2-3}$, and is not important.	1
Alnus nepalensis, *Don.*	Utis ...	3,000—7,000	$\frac{80-100}{30-40+6-10}$	3	D	9 to 10	12 to 1	Common in jhoras. Occasionally used for building and box-planking.	
Quercus glauca, *Thunb.*	Phalát ...	3,000—8,000	$\frac{80-100}{30-40+8-12}$	8 to 10	E	4 to 5	9 to 10	One of the commonest and next to búk, the most useful of the oaks. One of the best woods for buildings, but warps and cracks. An excellent fuel	1
,, lineata, *Blume.*	Phalát ...	4,000—7,000	$\frac{60-80}{20-30+6-8}$	...	E	4 to 5	9 to 10	Best distinguished by the hemispheric depressed acorns.	1
,, lamellosa, *Smith.* ..	Bajrát, Búk ...	6,000—9,000	$\frac{100-120}{30-40+15-20}$	8 to 12	S D	4 to 5	11	Perhaps the best timber in the tract for large beams, and the best fuel. Also used for furniture, more especially the frame-work. Fruits every two or three years.	1
,, pachyphylla, *Kurz.* ...	Bara or Singori Katus.	6,000—10,000	$\frac{80-100}{30-40}$	8 to 10	E	...	11	Preferred to búk for planking and shingles. Germination of seed uncertain.	1
,, fenestrata, *Roxb.* ...	Arkhaulo, Patle Katus.	5,000—8,000	$\frac{60-80}{20-30+5-6}$	...	E	3 to 4	...	Common. Generally sends up two or three stems. Timber not used.	1
,, spicata, *Smith.* ...	Arkhaulo ...	2,000—5,000	$\frac{40-60}{20-30+3-5}$	...	E	3 to 4	9 to 10 of 2nd year.	Wood not used except for fuel. Coppices freely. Has been planted in Rangirum block above its proper elevation.	1
Castanopsis indica, *A. DC.* ...	Katus ...	Up to 6,000	$\frac{20-40}{10-20+3-5}$	...	E	11 to 12	9 to 10	Very common. Used for all kinds of building, scantling and the best wood for shingles.	1
Castanopsis Hystrix, *A. DC.* ..	Katus ...	5,000—8,000	$\frac{100-120}{30-50+10-20}$	8 to 10	E	5	9 to 10	Common in the Takdah forest	

A number of orchids form dense growths on the branches of trees thus giving a lodging to snow and rendering them more affected by the wind. Perhaps the most important in this respect are:—

Orchidaceæ.									
Cœlogyne ochracea, *Lindl.* ...	...	5,000—7,000	...	...	...	4 to 6	..	Epiphytic with crowded polished 2-leaved pseudo-bulbs and bunches of white scented flowers with yellow blotches. Very common.	4
Otochilus porrecta, *Lindl.* ...	...	3,000—6,500	...	...	..	3 to 5	6 to 7	Epiphytic with numerous superposed pseudo-bulbs, very common, and often forming very large masses on trees.	4

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APPENDIX II—*concluded.*

THE FLORA—*concluded.*

Classified List of the more important Plants found in the Darjeeling Forests—concluded.

Scientific name.	Native name.	Elevation.	Formula.	Number of rings per inch of radius.	Deciduous or evergreen.	Time of— Flowering.	Time of— Fruiting.	Remarks.	Habit.*
Scitamineæ.		Feet.				Month.	Month.		
Cautleya Cathcarti, *Baker.* ...	...	6,000—8,000	...	...	...	6 to	7 to 8	Perennial. 1-2 feet. A common herbaceous plant with yellow flowers. Stout.	4
„ lutea, *Royle.*	...	7,000—8,000	...	...	...	7 to 8	...	Perennial. Slender. 1 foot. Bracts green. Flowers yellow. Banks, etc.	4
„ spicata, *Baker.*	...	Up to 8,500	...	...	...	7 to 8	9 to 10	Perennial. Very stout. Flowers yellow. Bracts red. Damp places.	4
Musa sp.	...	Up to 6,500	...	...	...	6 to 8	7 to 10	Characteristic of poor growth and bad soil ...	4
Hedychium Gardnerianum,— ...	...	3,000—7,000	...	...	...	8 to 9	...	4—5 feet high, very stout with large panicles of yellow flowers. Very common. There is also another common species very much slenderer in all respects.	4
Commelynaceæ.									
Streptolirion volubile, *Edgw.* ...	Jetti sak ...	6,500—8,000	...	...	...	...	...	A slender, creeping, succulent herb. A good fodder. Several species of Commelynaceæ are common.	4
Amaryllideæ.									
Curculigo sp.	...	About 7,000	...	...	...	...	...	A common grass-like herb used for fodder. The leaves have a peculiar habit of swaying to and fro, even when there appears to be no wind.	4
Palmæ.									
Plectocomia himalayana, *Griff.* ...	Takri Bet ...	4,000—7,000	...	...	...	...	...	Very common in poor forest below 6,000 feet. Canes soft.	3
Gramineæ.									
Oplismenus compositus, *Roem.* ...	Chhota Banspatti.	About 8,000	...	...	...	8 to 9	10 to 12	A common soft grass, and an excellent fodder. There are several other characteristic grasses which are also useful as fodder, but their names are not known.	
Arundinaria racemosa, *Munro.* ...	Máling ...	7,000—13,000	...	...	...	...	...	The most useful fodder of Darjeeling. It covers large areas, where trees are not found, or only give a light shade, and has been planted in the Goom block. The bamboo is said to have flowered in Sikkim in 1858-59, thirty-one years since last recorded time.	
Cephalostachyum capitatum, *Munro.*	Gopi	2,000—6,500	...	...	...	...	...	A very good fodder. This bamboo flowered and died in 1874-75, and is not very common.	
Filices.									
Gleichenia glauca, *Hook.*	...	4,500— 7,500	...	...	...	...	...	A large straggling fern common on steep banks.	
Alsophila Oldhami, *Bedd.*	...	5,000— 6,000	...	...	...	...	...	The common tree fern.	
Hymenophyllum Simonsianum, *Hook.*	...	4,000—10,000	...	...	...	...	...	Very common on tree trunks.	
Leucostegia nodosa, *Presl.* ...	...	3,000— 7,000	...	...	...	...	...	Common. Fronds, 1-3feet, much divided, membranous.	
Campteria Wallichiana, *Ag.* ...	...	3,000— 8,000	...	...	...	...	...	2—5 feet. Very common in open places.	
Plagiogyna pycnophylla, *Kunze* ...	...	7,000— 8,000	...	...	...	...	...	Stout, with fleshy triquetrous stipes, 2—3 feet. Fronds of two kinds.	
Athyrium nigripes, *Mett.*	...	3,000— 4,000	...	...	...	...	...	Common. Fronds numerous, 1—3 feet.	
Diplazium Stolliczkæ, *Bedd.* ...	...	6,000—10,000	...	...	...	...	...	Very common under shade between 6,000 and 7,000 feet. Fronds 1 to 2 feet, with blackish stipes, usually growing in a whorl on the rather elevated caudex.	
„ umbrosum, *Smith.* ...	...	4,000— 8,000	...	...	...	...	...	Very large. Fronds 3 to 5 feet and primary pinnæ nearly 2 feet. Very common in damp undergrowth.	
Allantodia javanica. *DC.*	...	4,000— 7,000	...	...	...	...	...	1 to 2 feet. Common.	
Lastrea dissecta, *Forst.*	...	4,000— 7,000	...	...	...	...	...	Very abundant.	
„ splendens, *Hook.*	...	6,000— 7,000	...	...	...	...	...	Fronds 4 feet. Common. Several other species of Lastrea are also very common under shade.	
Phegopteris auriculata, *Wall.* ...	...	5,000— 8,000	...	...	...	...	...	Stipes stout with whitish hairs. Fronds 3 feet or more. Common.	
„ distans, *Don.*	...	3,000— 8,000	...	...	...	...	...	Common, 1—3 feet. Very villous or pubescent. Open places or in light shade.	
Goniophlebinum amœnum, *Wall.*	...	4,000—11,000	...	...	...	...	...	Common, creeping. Fronds 1 to 2 feet.	
Pleopeltis norma is, *Don.*	...	4,000— 8,000	...	...	...	...	...	Common, climbing on trees.	
Syngrammé fraxinea, *Don.*	...	1,000— 8,000	...	...	...	...	...	Very common. Fronds 1 to 4 feet.	
Angioptoris evecta, *Hoffm.* ...	...	1,000— 7,000	...	...	...	...	...	Common in jhoras, very large, 6—15 feet. Rhizome made into a kind of flour and eaten.	
Lycopodiaceæ.									
Lycopodium clavatum, *Linn.* ...	...	...	...	...	...	...	...	Very common, especially on banks in sandy places.	
Selaginella, *sp.*	...	...	...	...	...	...	...	There appear to be two common species of this genus, usually found on damp banks.	

* { Shrub or woody climbers 3
Herb or herbaceous climbers 4

APPENDIX III.

DETAILED DESCRIPTION OF THE FORESTS.

SENCHAL WORKING-CIRCLE.

FOREST OR COMPARTMENT.		AREA IN ACRES.				Situation, configuration, and aspect.	Soil.	Crop.	Treatment, &c.
Name.	Number.	Well stocked.	Poorly stocked or blank.	Unproductive (enclosures).	Total.				
Senchal ...	I	1,215	340	...	1,555	On north-west flank of the range, sheltered by Tiger Hill and Senchal on the south and by the Jalapahar-Darjeeling range on the opposite side of the valley. Slopes generally moderate; spurs broad. Steep ground met with along the Rangnu river and the Jhora west of the block; also in the north-east part of the block, where steep and gently sloping ground alternate, and the soil is liable to slip, particularly in the lower portion formerly under cultivation. General aspect north-west, but west, north and east on the spurs. Elevation 4,000 to 7,500 feet.	Throughout the whole tract the soil is loamy; being derived from decomposed gneiss, which is everywhere the underlying rock. Here the soil is as a rule excellent—moist, deep, and fertile, with much vegetable mould. In a few places the ground is thickly strewn with boulders, perhaps due to former landslips. Some large masses of rock are found, chiefly in the north-east part of the block.	Two-thirds of the block very well stocked with two-storied high forest; rather thin in the southern corner. Oak, chestnut and champ extremely well represented in all classes above 6,300 feet, and gobria, lepchakawla, chilauni, dabdabi, &c., below that elevation. Lower storey characterised by kharani poles in the upper portion, while thali and lali are more abundant below. Kibu, lately common in undergrowth above 6,500 feet, has recently died, but its seedlings are springing up. In well-stocked area reproduction of most species very good. Buk, however, is scarce, and safed champ rather scarce, though titi champ is common. Seedlings most plentiful and well grown where undergrowth is thin or absent and the canopy of big trees lofty. A careful cleaning of about 85 acres at the south-west end of the block has shown that a plentiful advance growth of maple, kawla, and numerous other useful species exists, but that buk, champ and katus are scarce.	Regeneration fellings, with planting under shelter of the loftiest trees. Where lofty canopy is wanting, a suitable number of small trees and saplings must be left to shelter the plants as long as they need shelter. Where lofty canopy exists, the ground must be cleared of all undergrowth, except saplings of species valuable as timber, and seedlings of any kind of tree. In poorly-stocked areas planting will also be done in horizontal lines at a suitable distance apart, care being taken to preserve sufficient shelter.
D. ...	II	1,540	..	..	1,540	Occupies the upper basin of Rangbi Jhora. In the upper part of the block the ridges are long and narrow, and frequently rocky, with deep ravines in between. Gentler slopes and broader spurs are found in the north, and also in the lower part of the block. Aspect easterly in the northern portion, but the southern part of the block occupies the northern slope of the Sureil spur. The general aspect of the valley is north-east. Elevation 5,500 to 7,800 feet.	Composition and underlying rock the same. Soil excellent with abundant leaf mould, except in a few places, which are covered with turf near bathans. Generally speaking deep, except on steep ridges where rock crops out.	All classes well represented and mingled—a large proportion of overmature trees, chiefly oaks, chestnuts, maples, champ and kawla. Where trees are lofty a lower storey of kharani and kawla occurs in patches. Reproduction of kharani, kawla and other shade-bearing kinds good. Oak, champ and maples found chiefly on ridges, or where light is admitted. Oak rather more common in upper part of the block, but saplings and poles mostly deformed. Undergrowth of máling above 7,000 feet; dead stems of kibu, ferns, and numerous herbs abundant below. Cane found in many places near the lower edge of the block.	Amelioration fellings, removing trees over 9 feet girth and hollow trees. Cleanings and thinnings to be done, where useful, to favour the growth of promising poles of good kinds.
Do. ...	III	1,570	120	...	1,690	Upper basin of the Rangjo river, with numerous spurs and streams converging towards the lower part of the block. Slope generally steep in the highest and lowest parts. General aspect of valley north-east. Elevation about 5,100 to 7,800 feet.	De-composed gneiss; fairly good and fertile, generally clayey. The surface soil has suffered in many parts from exposure and grazing, mostly in the lower part of the block. Near the source and north of the river, rock and loose boulders are frequently met with. In the upper part leaf mould is generally abundant where the forest is better stocked.	Irregular and, except near the ridge, incomplete; composed chiefly of poles with little underwood; many blanks, notably round graziers, bathans; large grassy blanks, (interspersed with scrub of jhingnu, bilauni, brambles, ferns, &c.,) along the lower edge of the block north of the river. Near the ridge, and generally above the Sureil road, the crop, though still irregular, is nearly complete; poles predominate. Large openings in the upper storey, due to the removal of big trees. In the lower storey saplings and small poles of kharani are very numerous, with some maples, kawla, and a few buk and champ.	Careful amelioration fellings. All undergrowth which is not irretrievably damaged must be carefully preserved.
Do. ...	IV	1,478	120	2	1,600	On the west of Senchal range, south of Rangbul; cut up by streams. General slope moderate, but steep at north end above the old military road; and steep to very steep and rocky at south end of block, in upper basin of Runum Jhora. Elevation 7,000 to 8,000 feet. Aspect of middle and main portion westerly; steep parts have a south aspect.	Derived from gneiss. Composition variable, but on the whole very good. Even in the steepest portion there is often leaf mould and good soil; the rock crops out, however, in several places in the interior, and along the cart-road at the lower edge of the forest. Boulders are frequent.	The stock is composed mainly of saplings and small poles, often very crowded, with a few large poles and big trees standing over them at intervals. Large trees are more numerous in the basin of the Rangmuk Jhora, towards the north of the block, below the old military road and west of Senchal (G. T. S.). In two outlying plots near Sonada the forest is extremely thin, consisting of a few old trees and a few bushes. Here the soil is clayey, often exposed and bare of surface vegetation.	Amelioration fellings, effecting the removal first of unsound big trees and those over 8 feet girth. Thinnings to be made in the young growth.

Senchal (Rangnu).	V	360	1,120	...	1,480	Block V consists of two parts, separated by the West Senchal ridge and pasture land. The northern part is on the Rangnu spur and several smaller spurs which descend steeply below the Pashok road; the ground being precipitous along the eastern edge of the block, and steep also on the west. The main spur is broad, but steep on the sides. Rocks and boulders are frequent, especially in the eastern half of the block. Elevation 5,100 to 7,350 feet.	Rather shallow except on broad ridges, where it is of the usual loamy character. In the upper part there is leaf mould. This has mostly disappeared in the lower part, but is again forming where thickets exist. Surface grassy in open places on the spur. The underlying rock is gneiss.	The old forest at the top of the block has been much thinned out, and parts clean-felled. Here there is now an irregular undergrowth of small trees and bushes, with numerous saplings and seedlings of kawla, maple, and kharani; together with some oaks, chestnuts, pipli, champ and lal-champ, most of which were planted since 1880. In the lower part of the block, and extending up the main spur almost to the road, young scrub forest only exists, the land having been under cultivation. A small plantation was made in 1880-81 with toon, pipli, some walnut and wattles. Toon and pipli did well, the walnut badly, and the wattles all died. There are still some acres of grass blanks which are slowly filling up with brambles and other bushes. On the whole the area is fairly covered with scrub. An experimental felling extending over a few acres, near milepost No. 1, was made by Mr. Chester in 1882-83, with a view to natural reproduction. It seems, however, that the forest was incomplete and irregular, and that patches of small poles and saplings were left as advance growth. Thus instead of a regular thicket of young growth, the reproduction obtained is that characteristic of selection fellings; the growth of weeds being less than in clean fellings, and that of seedlings somewhat better.	Amelioration fellings (having rather the character of careful selection fellings, where big trees exist), to uncover any patches of thicket, which are found to be complete. Cleanings to be made in the young growth in order to set free a sufficient number of saplings of valuable kinds. Blanks to be planted up; nurses being first provided by planting, where scrub growth is absent. Cleanings of plants in old plantations to be done when needful.
Senchal (Rangnu and Dooteria).	V	...	...	...	(*See* above).	This, the southern portion of block V, is situated on the western flank of the range, and chiefly on the north of the Dooteria spur, which is drained by the Bing Jhora. Slope rather steep above the old road, and moderate below. Aspect north-west and partly south-west. Elevation 5,500 to 8,000 feet.	On the whole excellent, deep and fertile. Humus rather scanty on former blanks. Composition varies from light sandy loam to rather stiff clay, but is always somewhat sandy. The underlying rock is gneiss.	Except trifling blanks near cart road, thicket almost everywhere complete; composed (in addition to trees planted) of saplings and coppice shoots of kharani, jhingni, maples, katus, kawla, paieli, asari, arupati, &c., together with brambles and other shrubs and bushes. Rubus lineatus is very abundant at the top of the block. Above the cart road a great part was clean-felled and planted, from 1868—1875. The earlier plantation was a failure owing to the rapid growth of brambles, weeds, inferior trees and coppice shoots, and to damage done by cattle. It was fenced in 1874-75, and the improvement was so great that the plantation was extended. In the older part the plants have not generally survived, yet there is room for improvement by thinnings. The more recent plantations have been more successful, but weeds and brambles are too plentiful. Below the cart-road (Dooteria block) the forest was clean-felled within the past 10-12 years, a few scattered trees, mostly champ, being left. Mr. Chester says that it took several years for a growth of bramble, worm-wood, kharani, &c., to cover the soil. In lines cut through this jungle, plants of champ, oak, pipli, &c., were put out, and are succeeding sufficiently well to ensure a due proportion of the better species. In consequence of the clean-felling the growth is backward, and it will be years before grazing can be allowed.	Cleanings and early thinnings. The filling up of vacancies has been repeated year after year, so that in many places young plants are found almost smothered by the older growth, amongst which also plants of valuable species need attention. Old paths must be cleared and compartments be marked out for the proper control of the cleanings, and to ensure their being repeated at regular intervals as prescribed. Where thicket is complete the isolated big trees may be felled if they are not in a good and flourishing condition.
Senchal pasture	...	250	300	...	550	Includes the top of Tiger Hill and the ridge to the west of it as far as Jorbungalow. The summit is broad and fairly flat, having been more or less levelled for barracks long abandoned. On the north there is a rocky and steep descent to Pashok road, the limit of the area. The southern and western slopes are moderate. Aspect north-north-east, south-south-west, and partly west at the end of the ridge. All aspects on Tiger Hill. Elevation of the summit of ridge about 8,150 feet (Tiger Hill, 8,515 feet). Lower limit 7,350 feet on north. On south from 7,350 rising to 8,250 at the saddle south of Tiger Hill.	Generally good and of the usual loamy character even on ridge, where it is rather shallow and covered with turf. Rocky in many places on north slopes. Gneiss forms the underlying rock.	North face of hill fairly stocked with big trees (búk, champ, lal-champ, katus, kawla, maples, &c.). Here the forest has been heavily thinned by removing most of the old hollow trees. Undergrowth dense, composed of poles, saplings, bushes, máling and weeds. On west face of hill a few scattered big trees with scrub and thickets. On the south grassy slopes, descend in several places to the edge of the area, whilst brambles, asari, máling, &c., are found in hollows with thickets of kawla, paieli, katus, lal-champ, &c. Growth rather stunted on the summit.	Selection fellings.
Bara Senchal...	...	625	45	...	670	Comprises the rounded summit of Senchal mountain and the ridge to the south. Numerous streams take their rise within this area. Ground frequently rocky, specially on the east, and much cut up by streams near the Rangjo and Rangbi rivers, where large masses of rock, sharp spurs, and deep ravines are frequent. Slopes moderate on the west.	Extremely good where not rocky or excessively steep; a deep fertile loam of varying composition. Humus abundant in most parts, underlying rock, gneiss.	Irregular high forest with groups of young trees here and there. Búk, katus, maple, lal-champ, kawla, paieli, mya and some champ. Much rhododendron (*R. grande*), especially in moist situations. *Litsæa Kingii* (siltimur) common, and a small tree resembling arupati. A stunted growth of this, mingled with bamboo, is found on the summit of Senchal.	Ditto.

APPENDIX III.

DETAILED DESCRIPTION OF THE FORESTS—*continued.*

MAHALDARAM WORKING-CIRCLE.

FOREST OR COMPARTMENT.		AREA IN ACRES.				Situation, configuration, and aspect.	Soil.	Crop.	Treatment, &c.
Name.	Number.	Well stocked.	Poorly stocked or blank.	Unproductive (enclosures).	Total.				
Mahaldaram ...	I	525	185	...	710	On the north-eastern slope of Mamrim spur. The elevation of the lower edge varies from about 5,000 feet to 6,175 feet, while the highest point of the block is about 7,200 feet. In the upper part knolls and dells are numerous, and the aspect ill-defined. Below 6,500 feet the ridges are well-defined and numerous, running north-east, which is the aspect of the block. The slope on the whole is moderate, but steep rocky scarps (30-50 feet deep) occur.	The soil is in most parts clayey, though sandy soil occurs in small patches here and there. It varies from shallow to deep. In the steeper parts of the block bare rock crops out and boulders are common. Gneiss is the underlying rock.	Upper part over-mature, rather open high forest, interrupted by patches of younger trees. Where canopy is incomplete there is generally a lower storey, mostly of kawla, paieli and asari; the ground being covered with weeds, and natural reproduction, except of kawla, poor. Máling bamboo very plentiful above 7,000 feet. Oak and chestnut abundant, some fine specimens, but many hollow. Champ trees rather scarce, but a number of seedlings were found. A strip of forest, mostly second-growth, containing mallota, kanakpa, kharani, &c., with a few big trees of lepchakawla gobria, &c., extends along the lower boundary of the forest. Cane occurs in several jhoras.	Regeneration fellings with planting proceeding from south to north.
Ditto ...	II	510	70	...	580	On east slope of Chattakpur ridge. Upper limit about 7,000 feet; lower limit varies from 5,000 to 5,500 feet. The aspect varies from east to south-east and south, sweeping round the head of the Merung Jhora.	The usual mixture of sand, and clay, varying from place to place; rocky in upper part of Merung Jhora; better on ridges and in southern half of block, being a rather sandy clay with a fair amount of leaf-mould. Boulders very generally distributed. Underlying rock gneiss.	On some ridges in the north dead trees occur with an undergrowth of máling bamboo. A patch of second-growth forest and cane is found about the middle of the block. Remainder of block irregular high forest in which oak and chestnut preponderate; the largest being mostly unsound. Some champ occurs. Forest fairly well stocked; medium-sized trees in large proportion; young kawla and maple most numerous, with some champ. Young oak and chestnut are found mostly on ridges where there is more light. Berberis noticeable in undergrowth.	Amelioration fellings, removing trees over 9 feet in girth, and those which are dead or hollow. Care must be taken to leave the remaining stock as evenly distributed and as complete as possible. The under wood will be carefully preserved, but stems damaged in the felling operations will be cut, and if over 4 feet in girth will be reckoned as 'trees.'
Ditto ...	III	600	90	...	690	On the west slope of the Chattakpur ridge. Elevation varies from 6,000 feet to 7,800 feet. Slope moderate to steep. Steep slopes occur in the middle of the block about 6,800 feet. Aspect varies from west in the north of the block to south-west and south in the south part. The block is sheltered by the Chattakpur ridge.	Generally very good and of considerable depth. A sandy clay with much leaf mould, moss, and herbaceous vegetation. A good many boulders of gneiss occur, especially in the steeper parts, where the soil is sometimes shallow. Underlying rock gneiss.	Generally complete; saplings and small poles largely predominate and form of themselves a complete canopy. Old trees few. Kawla and other laurels, maples, and chestnut are most abundant, but some búk and phalát are found.	Amelioration fellings, consisting in the removal of big trees decayed or over 8 feet girth; and thinnings to favour growth of young trees and poles of champ, buk, phalát, and other valuable species. Undergrowth to be preserved.
Ditto ...	IV	670	55	...	725	The greater part is situated on the western slope of the Chattakpur ridge, and has a westerly aspect. The elevation of the top of the ridge varies from 7,100 to 7,330 feet, while the lower edge is between 5,700 and 5,800 feet. A small part of the block is on the east side of the ridge, and has a north-east aspect generally. Here the slope is moderate, but many boulders occur. The slopes on the western side are also for the most part moderate.	Clay and sand in good proportion; deep, except on the steepest slopes and rocky ground. Where cover is complete there is a good quantity of vegetable mould. On a small area of scrub and blanks near the cart road, the ground is covered with turf and weeds, and vegetable mould has disappeared.	Mostly an irregular two-storied high forest; upper storey very incomplete, consisting of trees of various sizes, the majority being unsound and badly shaped. Lower storey small poles and coppice shoots. In places these form dense growths, where no big trees occur. Principal species—kawla, maples, katus, paieli, and buk with some champ and sisi.	The same as is block III.
Ditto ...	V	465	210	...	675	On the western slopes of the Mahaldaram ridge. Slopes usually gentle, rarely steep. Cut up by several water-courses. Position sheltered by Mahaldaram ridge to the east. Elevation 5,500 to 6,700 feet. Aspect west.	Loam formed by the decomposition of the gneiss rock. Except on poorly-stocked areas, where the leaf mould has been replaced by grass, the soil is on the whole excellent.	Irregular forest, chiefly composed of poles. Large trees scarce and mostly decayed. There are numerous openings which have been planted up; but small blanks still occur in the scrub growth in the southern portion of the block, which occupies land formerly under cultivation. Repeated attempts made to plant up this portion failed owing to want of shelter. Poorly-stocked forest occurs also along the cart road.	Amelioration fellings, as in blocks III and IV, in the well-stocked portion. Blanks which are not likely to fill up naturally within a few years should be planted first with máling or some other hardy plants, and under their shelter plants, 2 or 3 years old of búk, katus, champ, &c., will be subsequently planted. Attention should be paid to secure the vigorous growth of any promising saplings of good kinds in the under-growth.

Suriel spur ...	...	275	310	...	585	This area is situated on the southern slope of the spur. The elevation of the lower edge varies from 5,000 to 5,500 feet, and that of the crest of the ridge from 5,900 to 7,500 feet; ground mostly steep, and cut up by numerous streams. Aspect south to south-east.	Soil generally shallow, and in many places the rock (gneiss) is exposed in great masses. On the broader ridges the usual good deep soil is met with.	An irregular forest; the better-stocked portion, consisting principally of overmature trees and of poles. In many parts only scrub growth, brambles and canes occupy the ground; while in one or two jhoras good forest is met with; several magnificent utis being specially noticed. Above 7,000 feet there is a fine growth of máling bamboo, among which saplings of oak, chestnut, champ, kawla, maple, and other good species are found scattered. At lower elevation cane takes the place of the bamboo.	Selection fellings, removing trees over 8 feet girth and those which are dead or hollow.
Chattakpur ridge. ...	...	475	...	...	475	For the most part on the eastern side of the top of the ridge, which varies in elevation from 7,200 to 8,100. Aspect generally east.	Sandy clay, with a fair amount of vegetable mould. In places the rock gneiss protrudes.	Irregular: on the eastern slope good oak, katus, and kawla are common, with some champ, maple, &c. On the top of the ridge big trees are rare; the stock consists mostly of poles with a good proportion of valuable species. Near the summit of Sureil spur there are many dead trees standing in a dense undergrowth of máling bamboo.	Ditto ditto.

TAKDAH WORKING-CIRCLE.

Takdah ...	I	195	260	...	455	On the southern face of Tungbu ridge. About three-fourths of area at sources of Noor Jhora, the rest is on the west of Poomoog ridge, and drains into the Rangjo Jhora. Slopes steep in many places, generally so in lower part of block, and southern face of Rangli-Rangliot spur, and in some jhoras precipitous. General aspect slightly east of south, but sides of jhoras face east and west. Elevation 5,000 to 6,768 feet.	Generally of good quality, being a rather stiff clay, but stony where slopes are steep. Soil rather more sandy in eastern portion of block. Fair amount of vegetable mould. Appearance of tree growth indicates fertile soil. Underlying rock, gneiss with bands of quartz.	Lower part of block formerly cultivated, now occupied by mallota with undergrowth of bilauni, jhingni, etc.; cane also met with in moist places. In upper portion forest open, chiefly old trees. Undergrowth of kibu, now dead, among which are seedlings of kawla, kharani, maple, and dudhila. Cane in many places. In 1877-78 and following years severe, if not clean, fellings were made for charcoal for tea-estates. Little natural reproduction was obtained except of second-growth jungle, and a great part of the ground was occupied only by brambles, grass and other weeds. Planting was undertaken in 1885 and was continued until 1890. Tún, champ, oak, pipli, bhadrasi, kawla, tarsing and a few walnut have been planted. In February 1887 a severe snowfall killed many tún plants; but this species has otherwise done well, and the plantation is a success on the whole. Plants have, however, in several places been put under dense cover, and are suffering from want of light.	Regeneration fellings in upper portion, with planting in horizontal lines under shelter of the loftiest trees available, if not already done. Where the shelter of a lofty canopy exists, the ground will be cleared of all noxious undergrowth, and here advance growth of saplings and flourishing young poles of useful species only will be left. Where lofty canopy is wanting, advantage must be taken of any available shelter. A great part of the area has already been planted. In this portion cleanings and early thinnings will be made as may be required.
Do. ...	II	435	30	...	465	Occupies the south side of the Tungbu ridge, and is drained by numerous streams tributary of the Rangjo Jhora. The slopes near the top of the ridge, where there are two small tarns, are moderate, and the ground undulating. Below 6,000 feet the slopes are steeper, but except in one or two jhoras near the boundary, nowhere very steep. Aspect south-south-east. Elevation 5,400 to 6,500 feet.	Of good quality and the usual composition. In places where the trees are spaced, the ground is covered with turf, lycopodium selaginella, ferns, etc. Underlying rock, gneiss.	The upper half of the block is composed of very irregular and incomplete high forest of oak, chestnut, champ, pipli, kawla and maple with frequent small grassy blanks which are gradually filling up with kharani, jhingni, barkholi, sisi, &c. In the lower part (generally speaking below 6,000 feet) second-growth forest, consisting chiefly of mallota and bilauni, dudhila, cane, kanakpa, gogen, &c., extends to the boundary.	Amelioration fellings, removing in the upper storey only trees over 9 feet girth and those which are dead, and in the lower storey deformed and useless poles which hinder the development of promising young growth. The fellings will have the character of thinnings in mallota forest, in favour of any useful trees that may be found.
Do ...	III	225	150	...	375	On north of Tungbu ridge, divided into two slopes by the Pujumpong spur. The larger portion (to the east) has a north-easterly aspect, while the western part faces the north-west. On the east side of the spur, below 6,000 feet, steep rocky slopes are met with; above this the slopes are usually fairly moderate. Elevation 5,200 to 6,550 feet.	A rather clayey soil. Good in upper, more gently sloping portion; rather rocky below, near the source of Rangbong Jhora. Below road the effect of denudation is apparent on land formerly under cultivation.	Forest fairly complete in the eastern portion near ridge; of the usual composition; trees of all ages occur, but medium sized predominate. On north-west slope the forest is thin. Here marks of cattle-trespass are manifest; the ground is covered with turf and trampled by cattle, whose tracks converge to cattle pens on khas land close to the forest boundary. Below road big trees are found about Pujumpong spur; eastward they are rare, and a fringe of scrub occurs along lower edge of forest. This is mostly bilauni, mallota and kanakpa, but trees of useful species, such as utis, chilauni, gobria, lepchakawla, titi champ, tarsing, bhadrasi and mowa are met with.	Amelioration fellings as in block II.
Do. ...	IV	235	190	...	425	At the eastern extremity of the Takdah spur, where this branches into minor spurs. The aspect is north, east and south. Slopes above 6,000 feet more gentle than those lower down, where the jhoras become steep and rocky. Elevation from 5,500 to about 6,300.	Same as in blocks II and III.	On the upper part of the ridge, above 6,000 feet, the usual type of irregular mixed forest, containing a fair proportion of poles with occasional big trees, is interrupted by numerous small blanks. Below there is a belt of second-growth forest, composed chiefly of mallota with occasional trees of utis, gogen, pipli, toon, lepchakawla, gobria, mowa, chilauni, &c. This is coming on well. Cane is found in many places.	Amelioration fellings as in blocks II and III.

APPENDIX III.

DETAILED DESCRIPTION OF THE FORESTS

TAKDAH WORKING-CIRCLE—*concluded.*

FOREST OR COMPARTMENT.		AREA IN ACRES.				Situation, configuration, and aspect	Soil.	Crop.	Treatment, &c.
Name.	Number.	Well stocked.	Poorly stocked or blank.	Unproductive (enclosures).	Total.				
Takdah ..	V	170	310	...	480	Almost all on south side of Tungbu ridge, at head waters of Rangu river Slopes very moderate in the upper half, but steep in the lower The narrow strip on the north side of the ridge has a fairly gentle slope. Elevation 4,750 to 6,500 feet.	In upper part of block more leaf-mould than in lower, where the surface soil has been exposed by cultivation within the past 20 or 30 years, otherwise the soil is of the usual character, viz., one in which sand and clay are mixed in varying proportion Gneiss forms the underlying rock.	What little high forest exists is found on and near the ridge, scarcely descending to 6,000 feet, and consisting mainly of kawla, maple and lepchakawla, with some oaks and chestnuts. Even here it is very thin, and there are occasional grassy banks with bushes of kharani, jhingni, básak, brambles, &c. The whole of the lower part of the block is occupied by second-growth forest, chiefly mallota, surmounting a scrub of bilauni, jhingni, dudhila, titapat, osbeckia, brambles, &c., with a few pipli, lepchakawla sankoli and kharani. Cane occurs in a few places.	Regeneration as in block I, except that close planting of cryptomeria should be done on suitable ground as extensively as possible.

TASIDING WORKING-CIRCLE.

Tasiding ..	I	340	160	...	500	The eastern portion of the block is on the slopes of the Batasi ridge below the cart-road, and has a north-west aspect The western and major part occupies a narrow valley, the sides of which face east and west Slopes are steep to very steep, and even precipitous in water-course at lower edge of forest. Elevation 5,000 to 7,200 feet.	Sandy clay, poor in the eastern upper portion, but improving under cover of bamboos In the western and lower portion good, but very rocky in places. Underlying rock, a compact gneiss.	In the upper portion, near Batasi village (formerly municipal grass-land), the removal of scattered trees was effected in 1882, and bamboos planted in 1883-84. The lower and steeper slopes are covered with natural forest, thinly stocked with big trees and containing scrub and occasional cane brakes Cane is also often found in jhoras where tree forest is absent The eastern slopes of Burbuttia spur are fairly stocked, but the crop is incomplete towards Goompahar, and at the bottom of the spur near the boundary.	Regeneration fellings with planting in horizontal lines, wherever ground is suitable, of champ, buk and chestnut in upper half, tún and pipli in lower, under shelter of máling and existing scrub in the eastern and of the loftiest trees in the western part.
Ditto ..	II	280	140	...	420	North of Goom Range. Slopes moderate on crests of spurs, precipitous on the sides of jhoras especially in the eastern branch of the Nai Jhora. The steepest slopes are in the lowest part of block, except on Tasiding ridge Aspect north. Elevation 4,800 to 7,000 feet.	Sandy clay; deep and substantial on moderate slopes, on steep slopes lighter, mostly vegetable mould, rock being nearer the surface.	In the lower part of block the crop is poor, consisting of second-growth mallota forest, interspersed with scrub and cane brakes; pipli seedlings being occasionally met with on newly exposed soil, such as land slips The forest improves above 6,000 feet, and is well stocked, but large trees are not plentiful Thickets of jhingni and kharani common. Reproduction generally good Seedlings of 1 to 2 years met with	Amelioration fellings to be made sparingly, removing only decaying trees, and those over 9 feet girth, where this can be done without making large gaps. The under growth should be kept as thick as possible. Protection is needed along the boundary, the demarcation of which must be improved.
Ditto ...	III	332	68	...	400	Occupies the valley of the Nai Jhora. Slopes steep to very steep and cut up by a number of ridges with very steep sides Steeper in upper part than Block II. General aspect north. Elevation about 5,000 to 7,500.	More rocky than in block II Frequently consists of leaf mould with gneiss rock close to the surface, but good where not rocky.	Forest mainly composed of chilauni, gobria, lepcha-kawla, arkaulo, katus chinama in lower half of block, forest of the usual type in upper part. Well stocked, forest of the usual class above, containing many big hollow trees. Mallota second-growth forest occurs in the lower part on both sides of the Nai Jhora.	As in Block II In the second-growth forest thinnings should be made in the interest of such trees of valuable kinds as may be found. Fellings to be sparingly made on steep rocky ground No sound trees under 8 feet in girth to be cut.

Ditto ...	IV	270	105	...	375	At head of Pringsa Jhora. Slope of ground more moderate on Bishihat ridge than in the western portion, which is very steep about half way down. The aspect circles round from north-west to east, but the general aspect is north. Elevation 5,200 to 7,500 feet.	Generally good in eastern portion, but shallow and often rocky in the south-west part of the block. For the most part light with abundant leaf mould. Begonias very common. Gneiss is the under-lying rock.	At the lower edge of the forest, where there are no big trees, second-growth forest occupies ground formerly under cultivation. Above this the crop improves, but is thin, comprising trees of all ages; poles predominate, kibu under-growth has died, allowing numerous seedlings and saplings of champ and maple to grow well. Towards Lepchajagat and the Bishihat ridge the forest improves and contains more large trees; champ is especially abundant here, and oak fairly plentiful. Seedlings of oak are found where soil is rich, light and free from weeds and the cover elevated; and, generally speaking, in places which rocks and boulders have rendered unsuitable for grazing.	Amelioration fellings favouring the development of the younger trees, of 3 to 4 feet in girth, of valuable kinds. Gradual removal in successive fellings of the old trees over 8 feet in girth, those being first removed which are defective or impede the growth of promising young trees.
Ditto ...	V	505	20	...	525	On the top of the Goom Range. Elevation varying from 7,250 to 7,980 feet. The hill tops are rounded, the slopes generally moderate; and though higher, this part of the ridge is more sheltered than that further west. General aspect north and south.	Good loamy soil. Masses of bare rock are found, such as the Goom rock, but more frequently on the north side of the range.	The forest is thin in a narrow strip along the southern edge, from which most of the old hollow trees have been removed; otherwise the crop consists of a two-storied high forest in which buk, champ, kawla, maple, and katus are the principal species. The lower storey consists chiefly of kharani, especially near the ridge, but on the southern slope bamboo to a great extent takes the place of kharani.	Amelioration fellings. Attention must be paid to the young growth, in order to favour the development as many young trees of good kinds as possible. This is especially necessary, as this block can not for some years be closed to grazing; and accordingly the old trees should only be removed where promising young forest has grown up beyond the reach of cattle.

Posambing Working-Circle.

Pasambing ...	I	134	160	11	305	Enclosed between Goom range and Palongdong spur, at the head waters of the Balasan river. Elevation 6,200 to 7,100 feet. Some gentle slopes in the lower part of the block on the west, and on some of the broader ridges at different elevations; but in general moderately steep. Aspect east and south-east.	Varies with the nature of the rock. Extensive bands of fractured quartz schist occur near Majdhura about the middle and east of the block. In these parts the soil is light and often shallow, the slopes being steep. Where the usual gneiss rock occurs the soil is loamy and fertile, though boulders are frequent. Damp hollows or glades occur here and there.	Very open and irregular, park-like in places, with no under-growth except scattered bushes of asari, and basak and a few kharani and jhingni saplings. A very large proportion of the crop consists of old decayed oaks and chestnuts, which species are also well represented amongst the smaller trees, together with kawla. There is a fair sprinkling of champ and maple. Generally speaking, the trees have very scanty crowns and a decayed appearance.	Regeneration fellings and planting. When grazing has ceased planting in horizontal lines will be commenced; máling and hardy species being introduced on blank areas, where necessary to shelter plants. On suitable ground near the boundary cryptomeria will be closely planted in a broad belt. Operations should proceed from south-west to north-east.
Ditto ...	II	275	10	...	375	South of Goom range at the head waters of the Balasan river, partly sheltered by Pubong ridge. The area comprises numerous streams and spurs. Aspect south. Elevation 6,000 to 7,000 feet. Slopes variable. In some places near streams and at foot of spurs very steep. Occasionally almost flat places are found.	Better in eastern than in western half of the block, where quartz schist is in great part the underlying rock. Here the soil is often shallow and poor, but where the ordinary gneiss occurs, the soil is fairly deep and fertile. Near bathans, and generally where the trees do not form canopy, the soil is more or less covered with weeds and turf.	Very irregular and open, composed of trees of various ages and generally with poor tops. A little better towards the east. Species mostly kawla, maples, paieli, oaks and chestnuts. Reproduction very scanty, underwood also scanty, and surface vegetation scrubby owing to grazing.	Amelioration fellings. As this block cannot now be closed to grazing, operations will be restricted to the removal of dead trees, and those which it is not advisable to leave until the next felling. All underwood and advance growth must be carefully maintained.
Ditto ...	III	310	45	...	355	Situated mostly on Pubong spur, on the western flank of which are numerous side spurs descending to the Balasan river. The east of the block comprises the upper basin of a small stream. Elevation 5,400 to 7,550 feet. Aspect north-west and south.	Except that humus is generally scanty, the soil, which is of the usual loamy character, is admirably suited to forest growth. Boulders occur, but are not so numerous as to interfere with forest vegetation. The under lying rock is gneiss.	Thin, with a patch of máling scrub east of the spur. Fuel operations have been carried on over the rest of the area, but only to the extent of thinning, leaving numerous trees and poles of oak, chestnut, champ, kawla, maple, paieli, &c. It appears that a regeneration felling was intended, and natural reproduction relied upon, assisted by advance growth of kharani, and bushes of asari, basak, &c., with a thick growth of maling bamboo in the upper part of the block. Kawla and maple have come up under these conditions, but oak, champ, and chestnut are not sufficiently numerous.	Amelioration fellings every fourth year. In the poorly-stocked areas trees of valuable species should be sought out and cared for. Here the operations will be of the nature of cleanings: in the better-stocked area, as the forest is already thin and it is necessary to allow grazing, the fellings will be restricted to the removal of decaying trees.

APPENDIX III.

DETAILED DESCRIPTION OF THE FORESTS.

Posambing Working-Circle—*concluded.*

Forest or compartment.		Area in acres.				Situation, configuration, and aspect.	Soil.	Crop.	Treatment, &c.
Name.	Number.	Well stocked.	Poorly stocked or blank.	Unproductive (enclosures).	Total.				
Posambing ...	IV	265	90	...	355	Comprises the upper basin of the Posam Jhora. Elevation 6,000 to 7,350. There are numerous small streams and rather narrow spurs. Slopes steep, excepting along top of spurs. Aspect southerly.	Fairly rich loam, rather more vegetable mould than in the other blocks of the circle. Gneiss is the under lying rock.	In upper portion the old forest has been thinned, and most of the overmature big trees have been removed; but there remains an open forest of poles with some big trees, chiefly kawla, oak, and chestnut, champ, maple, paieli, and mya, with a thick undergrowth of máling bamboo interspersed with kharani and jhingni poles and bushes. Seedlings and saplings of kawla, maples, kanakpa, and paieli fairly plentiful; besides which a few buk, champ and katus were found. In the lower part there are fewer big trees, a large proportion of lepchakawla, gobris, chilauni and dabdabi, with more undergrowth of kharani, jhingni, kanakpa, dudhila, phota, and chindia. Phota and khanakpa are also common in jhoras in the upper part.	Amelioration fellings, removing unpromising big trees which impede the growth of good poles of any useful species. This block must also be open to grazing, and the fellings will be very light.
Ditto ...	V	220	160	...	380	On the south of Goom range, extending over two small valleys on either side of Kundrukia spur. Elevation 6,300 to 7,700. Slopes fairly moderate along spurs, but steep in some parts and generally so on sides of spurs. Aspect south and south-east.	Bands of quartz-schist appear in some parts of this block, and in such places the soil is stony and light, but the ordinary gneiss rock is most common; so that on the whole, the soil is of the usual good quality. Vegetable mould is scanty, but appears to be forming where cover is complete.	Exceedingly patchy. The portion of the block above the cart road and an area on the Kundrukia spur have been clean-felled and planted with buk, champ, pipli and katus. The last is said to have suffered from snow and the pipli above the cart road seems to be above its natural limit. Búk and champ are doing extremely well. In the eastern part of the block, purchased from the Municipality in 1884, much of the old forest has been left in groups and bands, especially along jhoras, planting having been done on easy ground, as recommended by Sir D. Brandis; but few of the trees left are of any promise. The old forest has been thinned in the western part, and fair reproduction has been obtained of kawla and maple, but the undergrowth appears to be too thick for búk and champ. In the lower part of the block there is a large patch of second-growth forest.	Cleanings and removal of big trees where thicket is established, but maintenance promising young trees (2 to 3 feet girth) of the old forest, in groups and bands where ground is steep or rocky, and generally along water-courses. Thinning out of undergrowth and planting of large plants of búk, champ, katus, pipli, &c., must be done in places where valuable species are wanting. Special care must be taken to prevent trespass of cattle, as the adjoining block IV will be open to grazing.

Mim Working-Circle.

Mim	I	310	110	...	420	On the north of the Goom range, where this takes a south-west bend. The general aspect is north, but the sides of the spurs face almost east and west. Slopes generally steep between 6,000 and 7,000 feet except on top of principal spurs. Elevation 4,500 to 7,600 feet.	Mostly good, being derived from disintegrated gneiss; but towards the main ridge shallow, the rock there being a fractured quartz schist, which often crops out.	Upper part stocked with two-storied irregular high forest of the usual type. Big trees occur at intervals, but the stock chiefly consists of poles, the growth is generally bad. On the ridges good forest occurs, in which champ is fairly plentiful. Along lower edge of the block extensive areas of mallota forest occupy land formerly under cultivation. Seedlings of búk and champ scarce, owing to number of cattle grazing.	The want of export lines, and the necessity of arranging the periodic blocks in different circles in a manner convenient for supply at all periods, chiefly led to this block being taken in the first period. The generally poor condition of the crop also renders early regeneration advisable. This will be effected by planting under shelter of the loftiest trees. A larger proportion than that prescribed of poorly-stocked forest should, if possible, be taken during the first ten years when the demand will probably be least.
Do.	II	350	130	...	480	On the north of Goom range. General aspect north-west; sides of spurs facing nearly east and west; slopes generally steep between 6,000 to 7,000 feet, except on principal spurs. Elevation 5,3000 to 7,00 feet.	Poor and in many places shallow, being derived from a broken up quartz rock. It is generally light, and even sandy near Mim.	Upper part, except near Sukia-pokri, is stocked with irregular two storied forest as in Block I. Big trees rather scarce, except on the ridges where champ is common. Much mallota forest occurs along the lower boundary. A little below the Majdhura ridge in the west part of the block are numbers of dead and stag-headed trees standing in a thicket of máling bamboo, brambles, and young inferior tree	Amelioration fellings, removing decaying trees and trees over 9 feet girth, provided that the removal of the latter does not cause large gaps, and that the condition of the surrounding stock permits their removal.

Do.	III	337	20	3	360	For the most part situated on a broad spur north of Jorpokri. General aspect north-west. Elevation 5,500 to 7,200 feet. Slope of main spurs moderate, but their sides are occasionally very steep, and in a jhora on the west precipitous.	For the most part a light loam, excellent on the ridges and generally good, except where rocks protrude. The underlying rock is gneiss with bands of quartz-schist.	Greater part of the area very well stocked, with trees of good kinds, and a large proportion of kawla and other poles. Over fifty per cent. of the large trees are oaks, chestnuts, champ and maples. Dense undergrowth of kibu formerly prevailed mostly on the ridges, but is now dead, though springing up again from seed. Patches of scrub occur at intervals along the lower edge of the block, in which plantains and tree ferns are numerous, indicating a damp situation.	Amelioration fellings, removing principally the biggest trees, over 8 feet girth with low spreading crowns, here and there, in such a manner as to leave the promising, lofty, and well-grown trees of smaller size as evenly distributed as possible.
Do.	IV	333	13	...	345	North of the Goom range, except a very small piece on the south. The ground is broken and the aspect varies, but is mainly northerly. In the lower part there are several well-defined ridges and deep valleys. Slopes moderate in southern half and on ridges, but very steep on the sides of valleys. Elevation 5,300 to 7,600 feet.	Good on the whole, but poor in south-western corner. Light and loamy with a good quantity of humus. Large rocks crop out in places, and the jhoras are very rocky. Underlying rock the same as in block III.	Well stocked with trees of all classes, mostly oak, chestnut, and champ; large trees numerous. Two or three patches of second-growth forest on both sides of the block near the boundary, as well as on Permaigiri ridge. Undergrowth not dense, except dry kibu, which occurs mainly on the ridges. Máling bamboo occurs in the upper part, but is not plentiful.	Amelioration fellings, removing trees over 8 feet girth with a special care for well-grown young trees (3 to 4 feet girth) of good kinds.
Do.	V	333	35	2	370	At the source of the Little Rangit river, the area comprises a number of small spurs running north-west, which is the main aspect of the block. Elevation 4,700 to 7,600 feet; that of the saddle the head of the Little Rangit is 6,510 feet. Slopes steep immediately above the river, especially in the northern half of the block, elsewhere moderate.	Rocky along the Little Rangit and in south-east of the block; soil otherwise good, though boulders are frequent. Underlying rock the same as in blocks III and IV.	Very good except northern corner, and a patch in the south-east adjoining block IV. Dead kibu abundant on ridges, and dense growth of weeds in jhoras and along Little Rangit. In the scrub in the north corner many plantains are found and the trees are covered with creepers.	As in block IV.
Dungdungia Ridge.	...	170	20	...	190	Occupies a narrow strip at the top of the ridge, at head of the Balasan river. Situation exposed, especially on south side. Elevation 7,100 to 7,600 feet. Aspect north and south.	The cutting of the cart-road exposes masses of rock, in many places not far from the surface. The rock is mostly fractured quartz schist at western end, gneiss at the eastern. Soil fairly good, except in a few places along the old frontier road, where the forest having been destroyed, the soil is shallow, and the surface covered with turf.	Very thin at the western end, where blanks occur, and also about the middle of the area. The trees on the ridge are chiefly kawla, katus, buk and champ. Undergrowth of bamboo with bushes of asari, básak, &c.	This block is to be worked with Majdhura Ridge. Planting to be done under shelter of máling and bushes, where trees are wanting. Very sparing selection fellings over the remainder of the area.
Majdhura Ridge	...	10	16	5	31	Exposed situation on crest of ridge. Aspect north-west and south-east. Elevation from 7,100 to 7,350.	Sandy clay, stony and for the most part shallow, rather better towards the west. Underlying rock, fractured quartz schist.	Almost entirely devoid of large trees; many which were completely dead have been recently felled. These were killed by fire, possibly in 1876 or 1879. The ground is now mostly covered with a thicket of maling bamboos and brambles, &c. A few isolated trees, chiefly katus, kawla, champ, and buk are still found near Sukia-pokri location.	See Dungdungia ridge.
Jorpokri ridge	...	184	15	10	209	On ridge with broad-rounded top. There are two small pokris (tarns) in the location. Aspect north-west and south-south-east. Slopes moderate. Elevation 7,100 to 7,540 feet.	Of the usual loamy character; fairly deep in most parts, but rather shallow on the top of ridge, and stony at the north-east end. Here and there the soil has been laid bare, and in blanks there is a covering of turf.	Thin on top of ridge and at north-east end, where forest was burnt and bathans have been established. On north and south-west the crop is fairly complete; consisting chiefly of buk, katus, kawla, mya, paieh, kabashi, &c. Many of the trees unsound. Undergrowth of asari, máling, básak, berberis, kharani, phalami, &c.	Blanks to be planted up when grazing has ceased; máling being first introduced where shelter is wanting. Well-stocked area to be worked by careful selection fellings.

Nagri Working-Circle.

Nagri ...	I	230	225	...	455	Almost entirely on east side of Nagri spur. Elevation 5,400 to 6,700 feet. Slopes moderate to gentle in upper part, steep to very steep	On the whole excellent, but has suffered from exposure owing to heavy	Patchy. Cultivation existed in many parts before the forest was reserved. The intervening remnants of old forest have been repeatedly worked to supply neighbouring tea con-	It is essential to work steadily through this block, removing those of the remaining big trees which are of no promise and not required to

FOREST OR COMPARTMENT		AREA IN ACRES.				Situation, configuration, and aspect.	Soil.	Crop.	Treatment, &c.
Name.	Number.	Well stocked.	Poorly stocked or blank.	Unproductive (enclosure).	Total.				
						below, and scored by numerous deep ravines. Land liable to slip about middle of block, below a small "pokri" or tarn on the ridge Aspect east to north east.	fellings and in some parts to former clearances for cultivation. Thus the vegetable mould is scanty in these places, and the surface often covered with grass and weeds. The composition of the soil varies, is generally rather clayey, but often light, sandy, and very fertile. Underlying rock gneiss.	cerns with timber and fuel. These patches of forest occur mostly in the highest and northern part of the block, extending down one or two spurs, whilst mallota forest is found near the Raim jhora. The big trees consist chiefly of gobria and lepchakawla, with a sprinkling of kawla, chil aum, dabdabi, oaks, chestnut, champ, tarsing, barkholi and a few maples. One or two small walnut trees were also found. The undergrowth contains chiefly kharani, barkholi, and a fair number of maples, thali, gurpia, latikat, mallota, &c. Reproduction is on the whole remarkably good, considering the condition of the forest and the inroads of cattle. Champ seedlings are numerous wherever there are seed bearing trees, but are generally browsed. Buk also is not rare. It would seem that repeated fellings are not unfavourable to the reproduction of buk and champ.	give shelter. The area taken in hand must be planted up in horizontal lines with species suited to the locality, and useful for timber or fuel for tea concerns. The previous unmethodical style of working under which the same areas have been repeatedly worked necessitates planting and renders it advisable to work out the annual "coupe" so thoroughly that the young growth may for some years be free from any fellings except of the nature of cleanings, and also be protected from cattle.
Nagri ...	II	470	...	...	470	Occupies the upper part of several rather broad spurs below Jorpokri ridge. General slope very moderate, rather steep in eastern and western portions with occasional steep and rocky gorges in jhoras. Elevation 6,500 to 7,500 feet. Aspect south-east, changing to south, and south west in west of block.	Loamy, rich and fertile, rather swampy in one or two places, where springs break out, and shallow on very steep slopes. The surface soil has suffered from exposure and the tread of men and cattle near bathans and along paths, particularly in the east of the block. Boulders of gneiss occur here and there, but are not sufficiently numerous to interfere with forest growth.	Improvement thinnings and charcoal making have been recently carried on in part of the block, some of the dead or decaying trees with poor tops only being removed. The crop is fairly complete as regards canopy, being thin only in a few places. Oaks and chestnuts preponderate among the old trees with a good proportion of champ, kawla and maples. Jhingni poles are met with where cover is high, and where forest is poorly stocked, and bushes of asari and basak are found almost everywhere. Seedlings of oak and champ are rare, the block being open to grazing, but seedlings and saplings of kawla, maple, kharani, jhingni, &c., are common. Maling bamboos and ferns are chiefly found in the undergrowth in the upper part of the block.	Amelioration fellings to favour the development of crown of the best and loftiest trees which may be expected to assist in the regeneration of the forest. Careful maintenance of all undergrowth as thick as possible. Blocks II, III, and IV are to be divided into four sections as shown in the statement of fellings, but the rule of conducting the fellings with reference to the number of the block will still be observed.
Do. ..	III	472	10	8	490	On the upper part of Nagri spur, and southern flank of Goom range at the head of the Rangbong river. Elevation 6,400 to 7,550 feet. As usual, the tops of the ridges and spurs are generally rounded, steep ground occurring on their flanks.	Good, similar to that of block II. A few slips have taken place in jhoras, showing deep soil mixed with boulders, among which tree roots penetrate deeply.	Somewhat thin on the Nagri spur, well stocked at the head of the Rangbong river. In the former place big trees have to a large extent been cut for timber and charcoal, in the latter, made accessible by the construction of the Goompahar cart road only two years ago, many magnificent trees have been sold on permit, but the forest is still very fine, consisting of two stories, the upper story formed of trees of all classes, chiefly buk, phalat, katus, champ kawla, maples and dabdabi, very large trees preponderating. The under wood contains a large proportion of sanu paseli, phalami kawla, sisi, and other shade-bearing species. Kharani, however, is rather scarce.	Amelioration fellings. Trees of the principal species under 8 feet in girth should not be cut unless dead or so decayed that there would be serious loss in leaving them for the next exploitation. Trees above this girth may be cut if dead or badly decayed up to the full number allowed and if sound, provided that the surrounding crop is in good condition and is left sufficiently complete to cover the ground.
Do. ...	IV	505	..	...	505	A narrow strip of forest at the head waters of the Rangbong valley (west), chiefly occupying eastern slope of ridge the watershed line of which forms the boundary between British territory and Nepal. The main ridge and spurs generally broad, with numerous knolls and dells; steep slopes occur here and there and the jhoras are in many places steep and rocky. Aspect east and south-east, to south at head of valley. Elevation about, 6,300 to 7,559 feet.	Loamy clay. Underlying rock gneiss. Except in a few places along the frontier road, where turfy blanks occur on the ridge, the soil is well covered, rich, and fertile, with abundant leaf mould and generally light and porous under cover. Moss-covered boulders occur at intervals, but do not impede the growth of trees.	High forest consisting chiefly of large trees and poles. Exceedingly rich in oak, katus, and champ of very large size, together with maples, kawla, bhadrasi, mya dabdabi, &c. Undergrowth of kawla, paseli, phalami, asari, berberis, kibu (mostly dead), and maling in higher part, about 7,000 feet.	Amelioration fellings. The fellings will remove the largest trees and especially those with low-spreading crowns. Promising trees, sound and well grown, of species used for timber of less than 9 feet girth, should not be felled except for very special reasons. Poles of no promise will be removed, but those which are well grown will be carefully preserved. With a view to obtaining an undergrowth of straight, well-grown poles, the existing undergrowth will be cleared of all misshapen, small trees and shrubs.

Do.	...	V	235	340	...	575	Situated below block II. Several deep ravines, with steep and sometimes rocky sides, divide up the area. Very steep ground occurs in the Raam valley below 6,000 feet, and in the big jhora to the east of it. Slopes are otherwise steep to moderate, with gently sloping ground on Palongong spur near the boundary. Elevation 5,000 to 6,500 feet Aspect south to south-easterly and easterly in Raam valley.	Variable ; of the usual loamy character on broad ridges, but often light and sandy, rocky, and stony on slopes near Raam, and other large jhoras, in which bands of fractured quartz schist occur in places, though gneiss is the prevailing rock. West of the Raam jhora the soil has a tendency to slip in one or two places.	Very irregular and patchy. Much of the land was under cultivation before the forest was reserved. Thus extensive blanks and areas covered with scrub, second-growth, and mallota forest are found chiefly in the lower part of the block, with intervening bands or groups of the old forest, principally along the jhoras or on steep slopes The upper part of the block resembles block II, but is rather more open and has suffered more from grazing Gobria is abundant at lower elevations along with lepchakawla, tarsing, chilauni, chindia, bhadrasi, lankat, &c. A few toon and pipli are also found. In the upper part of the block katus, buk, and phalat are most abundant, together with kawla and a few champ and maple. Among the smaller trees, and in the underwood, kawla, sisi and other laurels are most abundant ; but chestnuts, oaks, magnolias and maples are well represented. In the lower part the small trees are mostly kharani, barkholi, jhingni, and unclassed species.	The condition of the crop in this block makes it advisable to work it out and plant without delay. It will therefore be worked together with block I during the 1st period. Blanks near the boundary will be closely planted with cryptomeria, plants or cuttings of some hardy species being at the same time put in to act as nurses. Those kinds should be used which cattle will not touch.

APPENDIX IV.

Grazing Rules.

NOTIFICATION.

The 10th October 1885.—Under the powers conferred upon him by section 75 (*d*) of Act VII of 1878, the Lieutenant-Governor is pleased to make the following rules to regulate grazing in the Reserved Forests of Darjeeling.

Rules.

1. Grazing in the Reserved Forests of the Darjeeling Forest Subdivision, other than those north of the Little Rangit river, is prohibited, except under the following rules and conditions.

2. Permits for grazing will be issued by the Forest Officers in charge of ranges, hereinafter referred to as range officers, for the calendar month, on payment of such fees as may from time to time be fixed by the Conservator of Forests, with the sanction of Government. The permits will fix the block or locality in which the privilege of grazing may be exercised: such blocks or localities shall be selected by the Divisional Forest Officer with regard to the protection of the forest, the convenience of the permit-holder, and the existing orders of Government on the subject, or orders which may in future be issued by Government.

3. He shall not be obliged to allow grazing in any given block to more than one head of cattle to every 10 acres of area, but on the other hand may locate any number of cattle in a block, provided the area available for grazing in that block be five acres per head

4. Grazing will be reserved for milk cattle required for the supply of milk and butter to the public in Darjeeling, Jellapahar, and Jore Bungalow, and for a number of draught cattle not exceeding 150 head.

The Divisional Forest Officer will not be bound to provide grazing for any cattle other than the above, but may, with the sanction of the Conservator, allow temporarily a larger number if he considers it can be done with due regard to the interest of the forest.

5. The construction of grazing camps, enclosures, or bathans is prohibited, except on the sites pointed out by the Divisional Forest Officer. Sites for two bathans shall be allowed to each grazier whose permit allows him to graze more than five head of cattle. Should more be required, or a change of site applied for, the question to be decided in case of dispute by the Divisional Forest Officer and Deputy Commissioner.

6. In cases in which the two bathans allotted to a permit-holder lie in two different blocks, he shall not leave one for the other without previous notice to the range officer, and without having the permission of this officer endorsed on the permit.

7. For the construction of, and repairs to, these bathans, permit-holders may utilize such dry fallen wood as may be found in the vicinity, and, with the permission of the range officer, canes and bamboos. Should sufficient dry wood not be available, the Divisional Forest Officer, or his subordinate under his orders, may mark and allow to be cut for this purpose trees of the less valuable kinds of smaller girth than 18 inches on pre-payment of annas 4 per tree. No charge will be made for canes, bamboos, or dry wood.

8. The Divisional Forest Officer may prohibit the construction of bathans for draught cattle.

9. The cutting and lopping of trees is prohibited. This rule does not apply to bamboos, creepers, and the trees known as *Dung-Dung* (Brassiopsis hamla) and *Dudhia* (Ficus gemella).* *See below*

10. Payment for permits for grazing will be made in advance on the first day of the month, and in case of payment not being made by the 10th, double fees may be charged; if not made by the 20th, the cattle may be driven out of the forest, or the defaulters prosecuted under section 25 (*d*) of the Indian Forest Act, and the issue of a permit refused, subject to appeal to the Conservator. Should the Conservator consider it desirable, payments may be made quarterly, but subject to the above provisions as to payment.

11. Buffaloes, goats, and sheep will not be allowed grazing in the forests forming the circles to be worked for the supply of fuel and timber to Darjeeling, Jellapahar, and tea plantations.

12. All permits will be kept at the bathans, and will be produced for inspection whenever called for by any Forest or Police Officer. On the expiry of the term for which a permit is issued, it shall be returned to the office of issue, and a fresh permit may be refused, unless the applicant produces his expiring or expired permit.

13. The range officer shall, after issue of a notice to any holder of a grazing permit, copy of which shall be sent for record to the Divisional Officer, require that on a day fixed, not less than seven days from the date of the notice, he shall have all his cattle within his bathan to allow of their number being checked with his permit. Such inspections shall not be made oftener than four times in the year: they shall ordinarily be held between the hours of 7 and 10 A.M., so as not to cause unnecessary inconvenience to the permit-holder, who may, however, by giving at least two days' notice to the range officer, fix any other hour between 8 A.M. and 6 P.M. of the day appointed by the notice that may be more convenient to himself. Should the permit-holder refuse or neglect to comply with the terms of the notice referred to above, or otherwise hinder the thorough inspection of his cattle, the issue to him of a fresh permit may be refused until he has complied with the requirements of this rule.

The Conservator may exempt by name, class, or locality any person or persons from the requirements of the preceding clause.

Nothing in this rule shall be held to debar any Forest or Police Officer from visiting and inspecting a bathan or cattle shed or pen within the Reserved Forests, or the cattle grazing in the forest.

14. Any Forest Officer attached to the Darjeeling Forest Division, to whom the range officer is subordinate, may exercise any of the powers conferred on a range officer by these rules.

H. H. RISLEY,

Offg. Secy. to the Govt. of Bengal.

NOTIFICATION.

* *The 19th November* 1885.—The Lieutenant-Governor is pleased to make the following addition to rule 9 of the rules for the regulation of grazing in the Reserved Forests of Darjeeling, published by Notification dated the 10th of October 1885 in the *Calcutta Gazette* of the 14th ultimo:—

The prohibition of cutting and lopping trees does not apply to the shrub known as Phulsari (*Rubus lineatus*).

A. P. MACDONNELL,

Secy. to the Govt. of Bengal.

See *Calcutta Gazettes* of 14th October 1885, Part I P. 937; and of 25th November 1885, Part I P. 1192; also see Government of Bengal, Revenue, Forests, No.1956 TR of 17th October 1885, to the Conservator, forwarding the rules and instructions concerning their enforcement.

APPENDIX V.

OUTTURN, 5 YEARS (1886-87 to 1890-91).

According to Working-Circles and Agency of Exploitation.

WORKING-CIRCLE AND BLOCK.	GOVERNMENT AGENCY.			PURCHASERS.							FREE GRANTEES.				TOTAL.			
	Timber and Fuel.		Other produce, value.	Timber and Fuel.				Other Produce.			Timber and Fuel.			Other Produce, value.	Timber and Fuel.		Other Produce.	
	Description.	Volume (estimated).		Description.	Quantity.		Value.	Description.	Quantity.	Value.	Description.	Quantity.	Value.		Description.	Quantity.	Description.	Value.
SENCHAL WORKING CIRCLE.		C. ft.	Rs. A. P.		No.	C. ft.	Rs. A. P.			Rs. A. P.		C. ft.	Rs. A. P.	Rs. A. P.		C. ft.		Rs. A. P.
Pangirum block ...	.....	...	...	Green trees ...	129	32,250	4 128 0 0	Bamboos ... No.	...	... 0 0	.....	...	...	...	.....	...	Bamboos ...	...
	.....	...	...	Dry and fallen wood.	..	1,930	514 0 0	Grazing No. of head.	(23)	21 0 0	... ..	...	...	...	... ..	...	Grazing ...	21 0 0
	.....	...	...	Poles ...	105	1,050	54 0 0	Fodder ... Mds.	6,614	106 0 0	.....	...	...	... (Seedlings 700)	.....	...	Fodder ...	106 0 0
	Timber ...	824	...	Total timber ..	...	35,230	4,496 0 0	Minor produce ...	...	7 0 0	.....	...	...	35 0 0	Timber .	36,054	Minor produce	4 0 0
	Firewood ...	96,751	...	Firewood and charcoal.	...	...	...	.....	...	...	Gobria wood (for experiment for gun-powder) taken as firewood.	32	1 0 0		.....	...	.....	...
	Charcoal ...	72,009	...	Dry sticks ...	...	5,621	50 0 0											
	Total fuel ...	168,760	...	Total fuel ...	...	5,621	50 0 0	.....	...	...	.....	...	...	...	Fuel ..	174,433	.....	...
	Total timber and fuel.	169,584	...	Total timber and fuel.	...	40,851	4,546 0 0	Total ...	...	134 0 0	Total ...	32	1 0 0	35 0 0	Total ...	210,467	Total ...	169 0 0
Dawaipani block ...	.....	...	...	Green trees ...	10	2,500	372 0 0	Bamboos ... No.	...	...	.....	...	...	...	.....	...	Bamboos ...	...
	.....	...	Fodder 39 maunds.	Dry and fallen wood.	...	...	...	Grazing No. of head.	...	...	.....	...	...	...	... ...	...	Grazing ...	...
	.....	...	1 0 0	Poles ...	24	240	3 0 0	Fodder ... Mds.	1,623	31 0 0	.....	...	...	...	.....	...	Fodder ...	32 0 0
	Timber ...	...	...	Total timber ...	...	2,740	375 0 0	Minor produce ...	...	69 0 0	.....	...	...	...	Timber ...	2,740	Minor produce	69 0
	Firewood ...	...	...	Firewood and charcoal.	...	...	...											
	Charcoal ...	...	...	Dry sticks ...	...	...	5 0 0											
	Total fuel ...	...	...	Total fuel ...	...	...	5 0 0	.....	...	...	.....	...	...	...	Fuel ...	...	.....	...
	Total timber and fuel	...	Total 1 0 0	Total timber and fuel.	...	2,740	380 0 0	Tota ...	...	100 0 0	.....	...	...	...	Total ..	2,740	Total ...	101 0 0
Tiger Hill block ...	.....	...	...	Green trees ...	4	1,000	162 0 0	Bamboos ... No.	...	...	.....	...	...	...	.....	...	Bamboos ...	...
	.....	...	...	Dry and fallen wood.	...	571	107 0 0	Grazing No. of head.	835	417 0 0	.....	...	...	...	.....	...	Grazing ...	417 0 0
	.....	...	...	Poles ...	16	160	4 0 0	Fodder ... Mds.	3,781	63 0 0	.....	...	...	...	.....	...	Fodder ...	63 0 0
	Timber ...	8	...	Total timber ...	...	1,731	273 0 0	Minor produce ...	...	...	.....	...	...	...	Timber ...	1,739	Minor produce	...
	Firewood ...	...	...	Firewood and charcoal.	...	...	...	.....	...	...	Firewood ...	437	12 0 0	...	.....	...	.....	...
	Charcoal ...	...	...	Dry sticks ...	...	52	4 0 0	.....										
	Total fuel ...	...	...	Total fuel ...	...	52	4 0 0	.....	...	...	Total fuel ...	437	12 0 0	...	Fuel ...	489	.....	...
	Total timber and fuel	8	...	Total timber and fuel.	...	1,783	277 0 0	Total ...	...	480 0 0	Total timber and fuel.	437	12 0 0	...	Total ...	2,228	Total ...	480 0 0

Rangjo block ...	.....	...	...	Green trees ...	16	4,000	582 0 0	Bamboos ... No.	...	...	.....	...	...	...	.....	...	Bamboos ...	...
	.....	...	...	Dry and fallen wood.	...	480	69 0 0	Grazing No. of head.	2,913 (+61)	1,582 0 0	.....	...	...	...	.....	...	Grazing ...	1,582 0 0
	.....	...	...	Poles ...	20	200	2 0 0	Fodder .. Mds.	4,112	64 0 0	.....	...	...	...	.....	...	Fodder ...	64 0 0
	Timber ...	12	...	Total timber ..	...	4,680	653 0 0	Minor produce ...	...	177 0 0	.....	...	...	...	Timber ...	4,692	Minor produce ..	177 0 0
	Firewood ...	...	...	Firewood and charcoal.	...	...	...											
	Charcoal ...	...	...	Dry sticks ...	...	156	1 0 0											
	Total fuel ...	...	...	Total fuel ...	...	156	1 0 0	.....	...	...	...	...	...	...	Fuel ...	156	.....	...
	Total timber and fuel.	12	...	Total timber and fuel.	...	4,836	654 0 0	Total ...	...	1,823 0 0	.....	...	...	...	Total ...	4,848	Total ...	1,823 0 0
Rangbi block ...	.....	...	...	Green trees ...	23	5,750	609 0 0	Bamboos ... No.	...	...	.....	...	...	...	.....	...	Bamboos ...	...
	.....	...	...	Dry and allen wood.	...	745	132 0 0	Grazing No. of head.	863	431 0 0	.....	...	...	...	.....	...	Grazing ...	431 0 0
	.....	...	...	Poles ...	...	...	...	Fodder ... Mds.	2,220	37 0 0	.....	...	...	...	.....	...	Fodder ...	37 0 0
	Timber ...	...	...	Total timber ...	...	6,495	741 0 0	Minor produce ...	...	26 0 0	.....	...	...	...	Timber ...	6,495	Minor produce ..	26 0 0
	Firewood ...	...	...	Firewood and charcoal.	...	...	...											
	Charcoal ...	...	...	Dry sticks ...	...	...	1 0 0											
	Total fuel ...	...	...	Total fuel ...	...	...	1 0 0	.....	...	...	.....	...	...	...	Fuel ...	...	.....	...
	Total timber and fuel.	...	...	Total timber and fuel.	...	6,495	742 0 0	Total ...	...	494 0 0	.....	...	...	...	Total ...	6,495	Total ...	494 0 0
[illegible] block ...	.....	...	...	Green trees ..	78	19,500	3,322 0 0	Bamboos ... No.	2,700	14 0 0	.....	...	...	...	.....	...	Bamboo ..	14 0 0
	.....	...	Fodder 22 maunds (nominal.)	Dry and fallen wood.	...	184	42 0 0	Grazing No. of head.	(19)	26 0 0	.....	...	...	...	.....	...	Grazing ...	26 0 0
	.....	...		Poles ...	...	...	...	Fodder ... Mds.	390	6 0 0	.....	...	...	...	.....	...	Fodder ...	6 0 0
	Timber ...	...	...	Total timber ...	...	19,684	3,364 0 0	Minor produce ...	...	30 0 0	.....	...	...	...	Timber ...	19,684	Minor produce ..	30 0 0
	Firewood ...	...	...	Firewood and charcoal.	...	...	..											
	Charcoal ...	...	...	Dry sticks ...	...	468	4 0 0											
	Total fuel ...	...	...	Total fuel ...	...	468	4 0 0	.....	...	...	.....	...	...	...	Fuel ...	468	.....	...
	Total timber and fuel.	...	...	Total timber and fuel.	...	20,152	3,368 0 0	Total ...	...	76 0 0	.....	...	...	...	Total ...	20,152	Total ...	76 0 0
Rangnu and Senchal blocks.	... ..	...	...	Green trees ...	9	2,250	329 0 0	Bamboos ... No.	200	2 0 0	.....	...	...	..	.....	...	Bamboos ...	2 0 0
	.....	..	...	Dry and fallen wood.	...	2,283	804 0 0	Grazing No. of head.	2,305 (+30)	1,197 0 0	.....	...	...	..	.....	...	Grazing ...	1,197 0 0
	.....	...	...	Poles	139	1,390	15 0 0	Fodder ... Mds.	36,901	545 0 0	.....	...	...	.. (Moss, 22 baskets.)	.....	...	Fodder ...	545 0 0
				Total timber ...	...	5,923	648 0 0	Minor produce ...	...	114 0 0	.....	...	...	6 0 0	Timber ...	5,948	Minor produce ..	120 0
	Timber ...	25	...	Firewood and charcoal.	...	7,505	365 0 0											
	Firewood ...	368,145	...	Dry sticks ...	...	41,439	469 0 0											
	Charcoal ...	...	...	Total fuel ...	...	48,944	834 0 0	.....	...	...	.....	...	...	...	Fuel ...	417,088	... ..	...
	Total fuel ...	368,145	...	Total timber and fuel.	...	54,867	1,482 0 0	Total ...	...	1,858 0 0	Total ...	...	...	6 0 0	Total ...	423,036	Total ...	1,864 0 0
	Total timber and fuel.	368,170	...															

APPENDIX V—*continued.*

OUTTURN, 5 YEARS (1886-87 to 1890-91).

According to Working-Circles and Agency of Exploitation.

WORKING-CIRCLE AND BLOCK.	GOVERNMENT AGENCY.			PURCHASERS.						FREE GRANTEES.				TOTAL.			
	Timber and fuel.		Other produce, value.	Timber and Fuel.			Other Produce.			Timber and Fuel.			Other produce, value.	Timber and Fuel.		Other Produce.	
	Description.	Volume (estimated).		Description.	Quantity.	Value.	Description.	Quantity.	Value.	Description.	Quantity.	Value.		Description.	Quantity.	Description.	Value.
SEONI SAL WORKING CIRCLE—*concluded.*		C. ft.	Rs. A. P.		No. C. ft.	Rs. A. P.			Rs. A. P.		C. ft.	Rs. A. P.	Rs. A. P.		C. ft.		Rs. A. P.
Dooteria block ...	.....	...	...	Green trees ...	9 2,250	326 0 0	Bamboos ... No.	...	...	.....	...	...	...	.....	...	Bamboos ...	...
	.....	...	Fodder 17 maunds (nominal.)	Dry and fallen wood.	... 191	22 0 0	Grazing No. of head.	(113)	223 0 0	.....	...	...	...	.....	...	Grazing ...	223 0 0
	.....	...		Poles ...	... ...	...	Fodder ... Mds.	18,495	268 0 0	.....	...	...	...	.....	...	Fodder ...	268 0 0
	Timber ...	...	Minor produce. 16 0 0	Total timber ...	... 2,441	248 0 0	Minor produce ...	...	22 0 0	.....	...	...	...	Timber ...	2,441	Minor produce...	38 0 0
	Firewood ...	...	...	Firewood and charcoal.	... 74,110	3,022 0 0											
	Charcoal	7,532	...	Dry stacks ...	... 4,108	38 0 0											
	Total fuel ...	7,532	...	Total fuel ...	... 78,218	3,060 0 0	.....	...	...	.....	...	...	..	Fuel ...	85,750	.....	...
	Total timber and fuel.	7,532	Total 16 0 0	Total timber and fuel.	... 80,659	3,308 0 0	Total ...	...	513 0 0		...	...	...	Total ...	88,191	Total ...	539 0 0
Rangbal block ...	.....	...	...	Green trees ...	2 500	91 0 0	Bamboos ... No.	...	...	.....	...	...	...	.....	...	Bamboos ...	...
	.....	...	...	Dry and fallen wood.	... 965	120 0 0	Grazing No. of head.	(64)	79 0 0	.....	...	...	...	.....	...	Grazing ...	79 0 0
	.....	...	...	Poles	290 2,900	39 0 0	Fodder ... Mds.	17,578	268 0 0	.....	...	...	...	.....	...	Fodder ...	268 0 0
	Timber ...	...	...	Total timber ...	... 4,365	250 0 0	Minor produce ...	...	28 0 0	.....	...	...	...	Timber ...	4,365	Minor produce...	28 0
	Firewood	10,552	...	Firewood and charcoal.	... 100,662	4,898 0 0											
	Charcoal	...	...	Dry stacks ...	... 15,424	191 0 0											
	Total fuel ...	10,552	...	Total fuel ...	... 116,086	5,089 0 0	.....	...	...	.....	...	...	...	Fuel ...	126,638	.....	...
	Total timber and fuel.	10,552	...	Total timber and fuel.	... 120,451	5,339 0 0	Total ...	...	375 0 0	.....	...	...	...	Total ...	131,003	Total ...	375 0 0
Senada block ...	.....	...	...	Green trees ...	1 250	55 0 0	Bamboos ... No.	...	...	.....	...	...	...	.....	...	Bamboos ...	...
	.....	...	...	Dry and fallen wood.	... 2,169	290 0 0	Grazing No. of head.	362(+11)	198 0 0	.....	...	...	...	.....	...	Grazing ...	198 0 0
	.....	...	...	Poles	9 90	1 0 0	Fodder ... Mds.	11,006	173 0 0	.....	...	...	... (Seedlings 100)	.....	...	Fodder ...	173 0 0
	Timber ...	...	...	Total timber ...	... 2,509	346 0 0	Minor produce ...	...	6 0 0	Green tree (1)...	250	28	50 0 0	Timber ...	2,759	Minor produce ..	56 0 0
	Firewood	22,727	...	Firewood and charcoal.	... 113,176	5,289 0 0											
	Charcoal	...	...	Dry stacks ...	... 15,072	140 0 0											
	Total fuel ...	22,727	...	Total fuel ...	... 128,248	5,429 0 0	.....	...	...	.....	...	...	...	Fuel ...	150,975	.. ...	...
	Total timber and fuel.	22,727	...	Total timber and fuel.	... 130,757	5,775 0 0	Total ...	...	377 0 0	Total ...	250	28 0 0	50 0 0	Total ..	153,734	Total ...	427 0 0

Pachim and Rinching tongdhara locks.	.....	...	...	Green trees ...	13	3,250	325 0 0	Bamboos . No.	...	...	.....	...	...	...	.....	...	Bamboos ...	...
	.....	...	...	Dry and fallen wood.	...	4,945	672 0 0	Grazing No. of head.	(24)	24 0 0	.....	...	...	...	... ..	...	Grazing ...	24 0 0
	.....	...	...	Poles	2	20	1 0 0	Fodder ... Mds.	7,248	96 0 0	.....	...	...	...	.....	...	Fodder ...	96 0 0
	Timber ...	1,046	...	Total timber ...	...	8,215	998 0 0	Minor produce ..	...	...	.....	...	...	.	Timber ...	9,361	Minor produce .	...
	Firewood	.	...	Firewood and charcoal.	...	19,014	877 0 0											
	Charcoal	19,229	...	Dry sticks ...	..	1,404	18 0 0											
	Total fuel ...	19,229	...	Total fuel ...	...	20,418	895 0 0	... ..	...	...	.....	...	...	...	Fuel ...	39,647	.....	...
	Total timber and fuel.	20,275	...	Total timber and fuel.	...	28,633	1,893 0 0	Total ...	...	120 0 0	.....	...	...	...	Total ...	45,908	Total .	120 0 0
TOTAL OF THE SENCHAL WORKING-CIRCLE. (Five years).	.....	...	...	Green trees ...	284	73,500	10,201 0 0	Bamboos .. No.	2,900	16 0 0	Green tree ... 1	250	28 0 0	...	.....	...	Bamboos ...	16 0 0
	.....	...	Fodder 78 maunds. 1 0 0	Dry and fallen wood.	...	14,463	2,072 0 0	Grazing No. of head.	7,278 (+345)	4,198 0 0	.....	...	...	...	.....	...	Grazing ..	4,198 0 0
	.....	...	...	Poles	605	6,050	119 0 0	Fodder ... Mds.	109,968	1,657 0 0	.....	...	...	...	.....	...	Fod ..	1,658 0 0
	Timber ...	1,915	Minor produce 16 0 0	Total timber ...	...	94,013	12,392 0 0	Minor produce ...	...	479 0 0	Total timber ...	250	28 0 0	Minor produce. 91 0 0	Timber ...	96,178	Minor produce ..	586 0 0
	Firewood	498,175	...	Firewood and charcoal.	...	306,467	14,451 0 0											
	Charcoal	98,770	...	Dry sticks ..	...	91,744	921 0 0											
	Total fuel ..	596,945	...	Total fuel ...	...	398,211	15,372 0 0	.....	...	...	Total fuel ...	469	13 0 0	...	Fuel ...	995,624	.....	...
	Total timber and fuel.	598,860	Total 17 0 0	Total timber and fuel.	...	492,224	27,764 0 0	Total ...	..	6,350 0 0	Total timber and fuel.	719	41 0 0	91 0 0	Total ...	1,091,802	Total ..	6,458 0 0
AVERAGE OF THE SENCHAL WORKING-CIRCLE. (Per annum).	Timber ...	383	...	Timber	...	18,802·6	2,478 6 5	Bamboos ... No.	580	3 3 2	.....	...	... 9 7	...	Timber	...	Bamboos ...	3 3 7
	Fuel ..	119,389	Fodder 0 3 2	Fuel	...	79,642·2	3,074 6 5	Grazing No. of head.	145,506(+69)	839 9 7	Timber ...	50	5 9 7	...	Timber ...	19,235·6	Grazing ...	839 9 7
								Fodder ... Mds.	21,993·6	331 6 5	Fuel ...	93·8	2 9 7	...	Fuel ...	199,124·9	Fodder ...	331 9 7
	Timber and fuel ...	119,772	Minor produce 3 3 2	Timber and fuel	...	98,444·8	5,552 12 10	Minor produce ...	...	95 12 10	Timber and fuel	143·8	8 3 2	Minor produce 18 3 2	Timber and fuel	218,360·5	Minor produce	117 3 2

NOTE.—Figures within brackets represent quantities on account of which compensation was accepted.

APPENDIX V—*continued.*

OUTTURN, 5 YEARS (1886-87 to 1890-91).

According to Working-Circles and Agency of Exploitation.

WORKING-CIRCLE AND BLOCK.	GOVERNMENT AGENCY.			PURCHASERS.							FREE GRANTEES.				TOTAL.			
	Timber and Fuel.		Other produce, value.	Timber and fuel.				Other produce.			Timber and fuel.			Other produce, value.	Timber and Fuel.		Other produce.	
	Description.	Volume (estimated).		Description.	Quantity.		Value.	Description.	Quantity.	Value.	Description.	Quantity.	Value.		Description.	Quantity.	Description.	Value.
MAHALDARAM WORKING-CIRCLE.		C. ft.	Rs. A. P.		No.	C. ft.	Rs. A. P.			Rs. A. P.		C. ft.	Rs. A. P.	Rs. A. P.		C. ft.		Rs. A. P.
Sepoydhura block	.....	...	...	Green trees ...	1	250	15 0 0	Bamboos . No.	...	...	.....	...	...	...	.....	...	Bamboos ...	...
	.....	...	...	Dry and fallen wood.	...	18,990	2,283 0 0	Grazing No. of head.	(59)	89 0 0	.....	...	...	...	.....	...	Grazing ...	89 0 0
	.....	...	...	Poles	1,918	19,180	195 0 0	Fodder ... Mds.	22,315	340 0 0	.....	...	...	...	.....	...	Fodder ...	340 0 0
	Timber ...	...	Minor produce 6 0 0	Total timber .	...	38,420	2,493 0 0	Minor produce ...	...	48 0 0	.....	...	...	...	Timber ...	38,420	Minor produce .	48 0 0
	Firewood ...	...	...	Firewood and charcoal.	...	45,873	1,630 0 0											
	Charcoal ...	...	...	Dry sticks ...	...	31,372	330 0 0											
	Total fuel ..	...	...	Tota fuel ...	...	77,245	1,960 0 0	.....	...	...	.....	...	...	...	Fuel ...	77,245	.....	..
	Total timber and fuel.	...	Total 6 0 0	Total timber and fuel.	...	115,665	4,453 0 0	Total ...	...	.471 0 0	.....	...	...	...	Total ...	115,665	Total ...	477 0 0
Chattakpur block	.....	...	...	Green trees ...	79	19,750	1,673 0 0	Bamboos . No.	...	...	.....	...	...	...	... ..	...	Bamboos ...	...
	.....	...	...	Dry and fallen wood.	...	7,177	824 0 0	Grazing No. of head.	2,493 (+32)	1,295 0 0	.....	...	...	...	.....	...	Grazing ...	1,295 0 0
	.....	...	...	Poles	77	770	19 0 0	Fodder ... Mds.	15,934	251 0 0	.....	...	...	...	.....	...	Fodder ...	251 0 0
	Timber ..	137	...	Total timber ...	...	27,697	2,516 0 0	Minor produce ...	...	1 0 0	.....	...	...	...	Timber ...	27,834	Minor produce...	1 0 0
	Firewood ...	...	...	Firewood and charcoal.	...	47,308	1,627 0 0											
	Charcoal ..	..	...	Dry sticks ...	...	6,475	79 0 0											
	Total fuel ..	...	...	Total fuel ...	...	53,783	1,706 0 0	.....	...	...	.....	...	...	...	Fuel ...	53,783	.....	..
	Total timber and fuel.	137	...	Total timber and fuel.	...	81,480	4,222 0 0	Total ...	...	1,547 0 0	.....	...	...	...	Total ...	81,617	Total ...	1,547 0 0
Mamram block ...	.....	...	...	Green trees ...	71	17,750	1,909 0 0	Bamboos ... No.	(60)	3 0 0	.....	...	...	...	.....	...	Bamboos ...	3 0 0
	.....	...	...	Dry and fallen wood.	...	600	63 0 0	Grazing No. of head.	(15)	45 0 0	.....	...	...	...	.....	...	Grazing ...	45 0 0
	.....	...	...	Poles	...	...	...	Fodder ... Mds	12,607	219 3 0	.....	...	...	...	.....	...	Fodder ...	219 0 0
	Timber ..	...	...	Total timber ...	...	18,350	1,972 0 0	Minor produce ...	...	6 0 0	.....	...	...	...	Timber ...	18,350	Minor produce	6 0 0
	Firewood ...	...	...	Firewood and charcoal.	...	164	6 0 0											
	Charcoal ...	...	...	Dry sticks ..	...	...	...											
	Total fuel ..	...	...	Total fuel ...	...	164	6 0 0	.....	...	...	.....	...	...	..	Fuel ...	164	.....	
	Total timber and fuel.	...	...	Total timber and fuel.	...	18,514	1,978 0 0	Total ...	...	273 0 0	.....	...	...	...	Total ...	18,514	Total ..	273 0 0

Sureil block ...	.....	...	...	Green trees ...	37	9,250	991 0 0	Bamboos ... No.	4,300(+85)	21 0 0	.....	...	...	...	.....	...	Bamboos ... 21 0 0
	.....	...	...	Dry and fallen wood.	...	576	106 0 0	Grazing No. of head.	(4)	13 0 0	.....	...	...	...	.....	...	Grazing ... 13 0 0
	.....	...	...	Poles	3	30	...	Fodder ... Mds.	5,982	93 0 0	.....	...	...	...	.....	...	Fodder ... 93 0 0
	Timber ...	238	Minor produce 18 0 0	Total timber ...	...	9,856	1,097 0 0	Minor produce ...	...	92 0 0	.....	...	...	...	Timber ...	10,094	Minor produce... 110 0 0
	Firewood ...	...	...	Firewood and charcoal.	...	...	...										
	Charcoal ...	...	...	Dry sticks ...	...	53	1 0 0										
	Total fuel ...	...	...	Total fuel ...	...	53	1 0 0	.....	...	...	.....	...	...	...	Fuel ...	53	....
	Total timber and fuel.	238	Total 18 0 0	Total timber and fuel.	...	9,908	1,098 0 0	Total ...	...	£19 0 0	.....	...	...	...	Total ...	10,146	Total .. 237 0 0
TOTAL OF THE MAHALDARAM WORKING-CIRCLE. (Five years).	.....	...	...	Green trees ...	188	4,700	4,588 0 0	Bamboos ... No.	4,300(+145)	24 0 0	.....	...	...	...	.....	...	Bamboos ... 24 0 0
	.....	...	...	Dry and fallen wood.	...	27,343	3,276 0 0	Grazing No. of head.	2,493(+110)	1,443 0 0	.....	...	...	...	.....	...	Grazing ... 1,442 0 0
	.....	...	...	Poles	1,998	19,980	214 0 0	Fodder ... Mds.	56,433	903 0 0	.....	...	...	...	.....	...	Fodder ... 903 0 0
	Timber ...	375	Minor produce 24 0 0	Total timber ...	...	94,323	8,078 0 0	Minor produce ...	...	141 0 0	.....	...	...	...	Timber ...	94,698	Minor produce... 165 0 0
	Firewood ...	...	...	Firewood and charcoal.	...	93,345	3,263 0 0										
	Charcoal ...	...	...	Dry sticks ...	...	37,899	410 0 0										
	Total fuel ...	...	...	Total fuel ...	...	131,344	3,673 0 0	.....	...	...	.....	...	...	...	Fuel ...	131,244	....
	Total timber and fuel.	375	Total 24 0 0	Total timber and fuel.	...	225,567	11,751 0 0	Total ...	...	2,510 0 0	.....	...	...	...	Total ...	225,942	Total ... 2,534 0 0
AVERAGE OF THE MAHALDARAM WORKING-CIRCLE. (Per annum).																	
	Timber	75	...	Timber	...	18,864·6	1,615 9 7	Bamboos .. No.	860(+29)	4 12 10	.....	...	...	...	.....	...	Bamboos ... 4 12 10
	Fuel	...	...	Fuel	...	26,248·8	734 9 7	Grazing No. of head.	498·6(+22)	288 6 5	.....	...	...	...	Timber ...	18,989·6	Grazing ... 288 6 5
								Fodder ... Mds.	11,287·6	190 9 7	.....	...	...	...	Fuel ...	26,248·8	Fodder ... 186 9 7
	Timber and fuel ...	75	Minor produce 4 12 10	Timber and fuel ...	...	45,113·4	2,350 3 2	Minor produce ...	...	28 3 2	.....	...	...	...	Timber and fuel	45,188·4	Minor produce... 33 0 0

NOTE—Figures within brackets represent quantities on account of which compensation was accepted.

APPENDIX V—*continued.*

OUTTURN, 5 YEARS (1886-87 TO 1890-91).

According to Working-Circles and Agency of Exploitation.

WORKING-CIRCLE AND BLOCK.	GOVERNMENT AGENCY.			PURCHASERS.						FREE GRANTEES.				TOTAL.			
	Timber and Fuel.		Other produce, value.	Timber and Fuel.			Other produce.			Timber and Fuel.			Other produce, value.	Timber and Fuel.		Other produce.	
	Description.	Volume (estimated).		Description.	Quantity.	Value.	Description.	Quantity.	Value.	Description.	Quantity.	Value.		Description.	Quantity.	Description.	Value.
TAKDAH WORKING-CIRCLE.		C. ft.	Rs. A. P.		No. C. ft.	Rs. A. P.			Rs. A. P.		C. ft.	Rs. A. P.	Rs. A. P.		C. ft.		Rs. A. P.
Poomong block ...	.....	...	...	Green trees ...	28 7,000	569 0 0	Bamboos No.	...	...	.....	...	...	...	.....	...	Bamboos ...	...
		...	Fodder 4 maunds (nominal).	Dry and fallen wood	... 230	18 0 0	Grazing { No. of head.	(23)	43 0 0	.....	...	...	...	.....	...	Grazing ...	43 0 0
				Poles	59 590	9 0 0	Fodder ... Mds.	9,259	123 0 0	.....	...	...	...	.....	...	Fodder ...	123 0 0
	Timber ...	...	...	Total Timber ...	... 7,820	596 0 0							Seedlings 2,000			Minor produce	383 0 0
							Minor produce ...	...	273 0 0	.....	...	...	110 0 0	Timber ...	7,820		
	Firewood	...	...	Firewood and Charcoal	... 6,156	224 0 0											
	Charcoal	...	...	Dry sticks ...	... 4,004	94 0 0											
	Total Fuel ...	...	...	Total Fuel ...	... 10,160	318 0 0								Fuel	10,160		
	Total Timber and Fuel	...	...	Total Timber and Fuel	... 17,980	914 0 0	Total ...	...	439 0 0	Total ...	...	...	110 0 0	Total ...	17,980	Total ...	549 0 0
Heom block ...	.....	...	...	Green trees ...	... ...	...	Bamboos No.	...	...	.....	...	...	...	.....	...	Bamboos ...	...
				Dry and fallen wood	... 202	19 0 0	Grazing { No. of head.	(82)	97 0 0	.....	...	...	...	.....	...	Grazing ...	97 0 0
				Poles	77 770	21 0 0	Fodder .. Mds.	17,065	253 0 0	.....	...	...	...	.....	...	Fodder ...	253 0 0
	Timber ...	236	...	Total Timber ...	... 972	40 0 0	Minor produce ...	...	194 0 0	.....	...	...	...	Timber ...	1,208	Minor produce	194 0 0
	Firewood	...	...	Firewood and Charcoal ...	... 22,462	822 0 0											
	Charcoal	...	...	Dry sticks ...	... 8,472	122 0 0											
	Total Fuel ...	...	...	Total Fuel ...	... 30,934	944 0 0								Fuel	30,934		
	Total Timber and Fuel	236	...	Total Timber and Fuel	... 31,906	984 0 0	Total ...	...	544 0 0	.....	...	...	...	Total ...	32,142	Total ...	544 0 0
Takdah block ...	.....	...	...	Green trees ...	34 8,500	784 0 0	Bamboos No.	400	2 0 0	.....	...	...	...	.....	...	Bamboos ...	2 0 0
				Dry and fallen wood	... 1,424	138 0 0	Grazing { No. of head.	1,172+(61)	680 0 0	.....	...	...	...	.....	...	Grazing ...	680 0 0
				Poles	15 150	6 0 0	Fodder ... Mds.	900	14 0 0	.....	...	...	...	.....	...	Fodder ...	14 0 0
	Timber ...	57	...	Total Timber ...	... 10,074	928 0 0	Minor produce ...	...	43 0 0	.....	...	...	...	Timber ...	10,131	Minor produce...	43 0 0
	Firewood	...	...	Firewood and Charcoal ...	... 27,083	969 0 0											
	Charcoal	...	...	Dry sticks ...	... 1,508	23 0 0											
	Total Fuel ...	...	...	Total Fuel ...	... 28,591	1,012 0 0								Fuel	28,591		
	Total Timber and Fuel	57	...	Total Timber and Fuel	... 38,665	1,940 0 0	Total ...	...	739 0 0	.....	...	...	...	Total ...	38,722	Total ...	739 0 0

TOTAL OF THE TAKDAH WORKING-CIRCLE. (Five years).	Timber ...	293	Fodder 4 mds. (nominal).	Green trees ...	62	15,500	1,353 0 0	Bamboos ... No.	400	2 0 0	.....	...	...	...	Timber ...	19,159	Bamboos ...	2 0 0
	Firewood ...	...	...	Dry and fallen wood	...	1,856	175 0 0	Grazing { No. of head.	1,172(.166)	890 0 0	.....	...	...	...	Fuel	69,685	Grazing ...	820 0 0
	Charcoal ...	..	...	Poles	151	1,510	36 0 0	Fodder ... Mds.	27,244	390 0 0	.....	...	...	...			Fodder .	390 0 0
	Total Fuel ...	...	...	Total Timber ...	...	18,866	1,564 0 0	Minor produce ...	...	510 0 0	.....	...	...	Seedlings 2,000 110 0 0			Minor produce	620 0 0
				Firewood and Charcoal ...	...	55,701	2,035 0 0											
				Dry sticks ...	...	13,964	239 0 0											
				Total Fuel ...	...	69,685	2,274 0 0											
	Total Timber and Fuel	293	...	Total Timber and Fuel	...	88,551	3,838 0 0	Total ...	...	1,722 0 0	Total ...	...	...	110 0 0	Total ...	88,844	Total ...	1,832 0 0
AVERAGE OF THE TAKDAH WORKING-CIRCLE. (Per annum).	Timber	58·6	...	Timber	...	3,773·2	312 12 0	Bamboos ... No.	80	0 6 5	.....	...	...	...	Timber ...	3,831·8	Bamboos ...	0 6 5
	Fuel ...	..	...	Fuel ...	...	13,937 0	454 12 10	Grazing { No. of head.	234·4(+33·2)	164 0 0	.....	...	...	...	Fuel	13,937	Grazing ..	164 0 0
	Timber and Fuel	58·6	...	Timber and Fuel	...	17,710·2	767 9 8	Fodder Mds.	5,448·8	78 0 0	.....	...	...	...	Timber and Fuel	17,768·8	Fodder ...	78 0 0
								Minor produce ...	...	102 0 0	.....	...	..	Minor produce 22 0 0			Minor produce	124 0 0
TASIDING WORKING CIRCLE. Goom block ...	.....	.....	.....	Green trees ...	128	32,000	2,472 0 0	Bamboos, No. ...	400	2 0 0	.....	...	...	...	...	...	Bamboos ...	2 0 0
	.....	.....	Fodder 62 mds. 1 0 0	Dry and fallen wood. ...	...	7,581	887 0 0	Grazing, No. of head.	(28)	42 0 0	.....	...	...	...	...	...	Grazing ..	42 0 0
				Poles	15	150	1 0 0	Fodder, Mds. ...	14,244	24 0 0	.....	...	...	...	...	...	Fodder	246 0 0
				Total Timber ...	...	39,731	3,360 0 0	Minor produce ...	...	88 0 0	.....	...	...	...	Timber ...	39,869	Minor produce	88 0 0
	Timber	138		Firewood and charcoal. ...	...	2,712	190 0 0	...	...	...	.....	...	...	...	...	...		
	Firewood	5,863		Dry sticks	...	14,196	165 0 0	...	...	...	.....	...	...	...	...	...		
	Charcoal	...		Total Fuel ...	...	16,908	285 0 0	...	...	...	.....	...	...	...	Fuel	22,771		
	Total Fuel ...	5,863																
	Total Timber and Fuel.	6,001	Total 1 0 0	Total Timber and Fuel.	...	56,639	3,645 0 0	Total	...	376 0 0	.....	...	...	...	Total ...	22,640	Total ..	377 0 0
Nal block	.....	.....	.....	Green trees ..	21	5,250	465 0 0	Bamboos, No. ...	4(+20)	1 0 0	.....	...	...	...	...	...	Bamboos ..	1 0 0
			Fodder 52 mds. 1 0 0	Dry and fallen wood. ...	...	25,142	3,283 0 0	Grazing, No. of head.	1,958(+53)	1,063 0 0	.....	...	...	...	...	...	Grazing ...	1,063 0 0
				Poles	38	380	4 0 0	Fodder, Mds. ...	30,690	516 0 0	.....	...	...	10 mds.	...	...	Fodder ..	517 0 0
			Minor produce, 2 0 0	Total Timber ...	...	30,772	3,752 0 0	Minor produce ...	...	41 0 0	.....	...	..	(nominal).	Timber ...	31,274	Minor produce	43 0 0
	Timber	502		Firewood and charcoal. ...	...	1,159	51 0 0	...	...	...	.....	...	...	...	...	...		
	Firewood	103,400		Dry sticks	...	11,960	122 0 0	...	...	...	.....	...	...	...	...	...		
	Charcoal	81,396																
	Total Fuel ..	184,796		Total Fuel ...	...	13,119	173 0 0	...	...	...	.....	..	...	...	Fuel	197,915		
	Total Timber and Fuel.	185,298	Total 3 0 0	Total Timber and Fuel.	...	43,891	3,925 0 0	Total	...	1,621 0 0	.....	...	...	...	Total ...	229,189	Total ..	1,624 0 0

APPENDIX V.

Outturn, 5 years (1886-87 to 1890-91).

According to Working-Circles and Agency of Exploitation.

Working-Circle and Block.	Government Agency.			Purchasers.						Free Grantees.				Total.			
	Timber and Fuel.		Other produce, value.	Timber and Fuel.				Other produce.			Timber and Fuel.			Other produce, value.	Timber and Fuel.		Other produce.	
	Description.	Volume (estimated).		Description.	Quantity.		Value.	Description.	Quantity.	Value.	Description.	Quantity.	Value.		Description.	Quantity.	Description.	Value.
		C. ft.	Rs. A. P.		No.	C. ft.	Rs. A. P.			Rs. A. P.		C. ft.	Rs. A. P.	Rs. A. P.		C. ft.		Rs. A. P.
Rishihat block ...	... ...	.....	.....	Green trees ...	18	4,500	520 0 0	Bamboos, No. ...	300	4 0 0	.....	...	...	...	...	...	Bamboos ...	4 0 0
				Dry and fallen wood.	...	2,101	458 0 0	Grazing, No. of head.	(24)	36 0 0	.....	...	...	...	...	...	Grazing ...	36 0 0
				Poles	6	60	14 0 0	Fodder, Mds. ...	3,521	64 0 0	.....	...	...	...	...	...	Fodder ...	64 0 0
				Total Timber ..	...	6,661	992 0 0	Minor produce ...	...	23 0 0	.....	...	...	...	Timber ...	7,949	Minor produce	23 0 0
	Timber	1,288		Firewood and charcoal.	...	60,679	2,601 0 0	...	...	...	.....	...	...	...	...	...		
	Firewood	1,461		Dry sticks ...	...	1,730	16 0 0	...	...	...	.....	...	...	...	...	...		
	Charcoal	.....						...	...	...	.....	...	...	...	...	...		
	Total Fuel ...	1,461		Total Fuel ...	...	62,409	2,617 0 0								Fuel	63,870		
	Total Timber and Fuel.	2,749		Total Timber and Fuel.	...	69,070	3,609 0 0	Total	...	127 0 0	.....	...	...	...	Total ...	71,819	Total ...	127 0 0
Total of the Tasiding Working-Circle.	.....	...	...	Green trees ...	167	41,750	3,457 0 0	Bamboos No. ...	1,304(+20)	7 0 0	.....	...	...	...	...	...	Bamboos ...	7 0 0
			Fodder 114 mds. 2 0 0	Dry and fallen wood.	...	34,854	4,628 0 0	Grazing No. of head.	1,958(+105)	1,141 0 0	.....	...	...	...	...	...	Grazing ...	1,141 0 0
(Five years.)	Timber ...	1,928	Minor produce 2 0 0	Poles	59	590	19 0 0	Fodder, Mds. ...	48,455	824 0 0	.....	...	...	10 mds.	...	...	Fodder ...	826 0 0
				Total Timber ..	...	77,164	8,104 0 0	Minor produce ...	...	152 0 0	.....	...	...	...	Timber ...	79,092	Minor produce	154 0 0
	Firewood ...	110,734		Firewood and charcoal.	...	64,550	2,772 0 0				.....	...	...	...	...	...	.....	...
	Charcoal ...	81,396		Dry sticks ...	...	27,886	303 0 0				.....	...	...	...	...	...	.....	...
	Total Fuel ...	192,130	Total 4 0 0	Total Fuel ...	...	92,436	3,075 0 0	.....	...	...	.....	...	...	...	Fuel	284,556	.....	...
	Total Timber and Fuel.	194,048		Total Timber and Fuel.	...	169,600	11,179 0 0	Total ...		2,124 0 0	.....	...	...	...	Total ...	363,648	Total ..	2,128 0 0
Average of the Tasiding Working-Circle.																		
(Per annum.)	Timber ...	385·6	Fodder 0—6—5	Timber ...	...	15,432·8	1,620 12 10	Bamboos No. ...	240·8(+4)	1 6 5	.....	...	...	...	Timber ...	15,818·4	Bamboos ...	1 6 5
	Fuel ...	38,424	Minor produce 0—6—5	Fuel	...	18,467·2	615 0 0	Grazing No. of head.	391 6(+21)	228 3 2	.....	...	...	...	Fuel	56,911·2	Grazing ...	228 3 2
	Timber and Fuel	38,809·6		Timber and Fuel	...	33,920	2,235 12 10	Fodder, Mds. ...	9,691	164 12 10	.....	...	...	...	Timber and Fuel	72,729·6	Fodder ...	165 3 3
								Minor produce ...	...	30 6 5	.....	...	...	...	...	...	Minor produce	30 12 0

POSAMBLING WORKING-CIRCLE. Tungsong and Pubong blocks.	.....	...	...	Green trees ...	1	250	39 0 0	Bamboos, No. ...	50	Nominal.	.....	...	...	...	...	...	Bamboos ...	...
	.....	...	Fodder mds. 104. 2 0 0	Dry and fallen wood.	...	6,438	912 0 0	Grazing, No. of head.	(112)	150 0 0	.....	...	...	...	...	...	Grazing ...	150 0 0
				Poles	13	130	1 0 0	Fodder Mds. ...	85,764	1,378 0 0	.....	...	...	...	...	...	Fodder ...	1,380 0 0
				Total Timber ...	...	6,818	952 0 0	Minor produce ...	...	11 0 0	.....	...	...	Saplings 900 45 0 0	Timber	6,836	Minor produce	56 0 0
	Timber	18	...	Firewood and charcoal.	...	79,258	3,231 0 0	.....	...	...	.....	...	...	...	...	...	...	...
	Firewood	12,438	...															
	Charcoal	103,502	...	Dry sticks ...	...	8,920	119 0 0	.....	...	...	.....	...	...	...	...	...	...	...
	Total Fuel ...	115,940	...	Total Fuel ...	...	88,178	3,350 0 0	.....	...	...	.....	...	...	...	Fuel	204,118	...	...
	Total Timber and Fuel.	115,958	Total ... 2 0 0	Total Timber and Fuel.	...	94,996	4,302 0 0	Total ...	...	1,539 0 0	Total ...	...	...	45 0 0	Timber and fuel	210,954	Total ...	1,586 0 0
Balasan block ...	.....	...	...	Green trees ...	10	2,500	364 0 0	Bamboos, No. ...	...	...	.....	...	...	...	...	...	Bamboos ...	...
				Dry and fallen wood.	...	8,689	1,211 0 0	Grazing, No. of head.	1,967(+38)	1,022 0 0	.....	...	...	...	...	...	Grazing ...	1,022 0 0
				Poles	...	...	...	Fodder Mds. ...	1,690	29 0 0	.....	...	...	...	...	...	Fodder ...	29 0 0
				Total Timber ...	...	11,189	1,575 0 0	Minor produce ...	...	...	.....	...	...	...	Timber	11,213	Minor produce	...
	Timber	24	...	Firewood and charcoal.	...	41,553	2,031 0 0	.....	...	...	.....	...	...	...	...	...	...	...
	Firewood	23,576	...															
	Charcoal	267,599	...	Dry sticks ...	...	...	8 0 0	.....	...	...	.....	...	...	...	...	...	...	...
	Total Fuel ...	291,175	...	Total Fuel ...	...	41,553	2,039 0 0	.....	...	...	.....	...	...	...	Fuel	432,728	...	...
	Total Timber and Fuel.	291,199	...	Total Timber and Fuel.	...	52,742	3,614 0 0	Total ...	...	1,051 0 0	.....	...	...	...	Timber and fuel	443,941	Total ...	1,051 0 0
TOTAL OF THE POSAMBING WORKING-CIRCLE. (Five years).	.....	...	...	Green trees ...	11	2,750	403 0 0	Bamboos, No. ...	50	Nominal.	.....	...	...	...	...	...	Bamboos ...	...
			Fodder 104 mds. 2 0 0	Dry and fallen wood.	...	15,127	2,123 0 0	Grazing, No. of head.	1,967(+150)	1,172 0 0	.....	...	...	...	...	...	Grazing ...	1,172 0 0
				Poles	13	130	1 0 0	Fodder, Mds. ...	87,454	1,407 0 0	.....	...	...	...	...	...	Fodder ...	1,409 0 0
				Total Timber ...	...	18,007	2,527 0 0	Minor produce ...	...	11 0 0	.....	...	...	Saplings 45 0 0	Timber	18,049	Minor produce	56 0 0
	Timber	42	...	Firewood and charcoal.	...	120,811	5,262 0 0	.....	...	...	.....	...	...	...	...	...	...	...
	Firewood	36,014	...															
	Charcoal	371,101	...	Dry sticks ...	...	8,920	127 0 0	.....	...	...	.....	...	...	...	...	...	...	...
	Total Fuel ...	507,115	...	Total Fuel ...	...	129,731	5,389 0 0	.....	...	...	.....	...	...	...	Fuel	636,846	...	...
	Total Timber and Fuel.	507,157	Total ... 2	Total Timber and Fuel.	...	147,738	7,916 0 0	Total ...	...	2,590 0 0	Total ...	...	...	45 0 0	Timber and fuel	654,895	Total ...	2,637 0 0
AVERAGE OF THE POSAMBING WORKING-CIRCLE. (Per annum).	Timber	8·4	Fodder 0-6-5	Timber	...	3,601·4	505 6 5	Bamboos No. ...	18	Nominal.	.....	...	...	...	Timber	3,609·8	Bamboos ...	...
	Fuel	101,423		Fuel	...	25,546 2	1,077 12 10	Grazing No. of head.	393·4(+30)	234 ·6 5	.....	...	...	...	Fuel	127,389·2	Grazing ...	234 6 5
	Timber and Fuel...	101,431·4		Timber and Fuel	...	29,547·6	1,583 3 3	Fodder Mds. ...	17,490·8	281 6 5	.....	...	...	...	Timber and fuel	130,979	Fodder ...	281 12 10
								Minor produce ...	...	2 3 2		...	...	Minor produce 9	...	...	Minor produce	11 3 2

APPENDIX V—*continued.*

OUTTURN, 5 YEARS (1886-87 TO 1890-91).

According to Working-Circles and Agency of Exploitation.

WORKING-CIRCLE AND BLOCK.	GOVERNMENT AGENCY.			PURCHASERS.							FREE GRANTEES.				TOTAL.			
	Timber and Fuel.		Other produce, value.	Timber and Fuel.				Other produce.			Timber and Fuel.			Other produce, value.	Timber and Fuel.		Other produce.	
	Description.	Volume (estimated)		Description.	Quantity.		Value.	Description.	Quantity.	Value.	Description.	Quantity.	Value		Description.	Quantity.	Description.	Value.
		C. ft.	Rs.		No.	C. ft.	Rs. A. P.			Rs. A. P.		C. ft.	Rs.	Rs. A. P.		C. ft.		Rs. A. P.
MIM WORKING-CIRCLE.																		
Chongtong block ...	.....	...	...	Green trees	256	64,000	6,941 0 0	Bamboos, No. ...	700	3 0 0	.. ...	...	...	...	.....	...	Bamboos ...	3 0 0
				Dry and fallen wood		6,326	966 0 0	Grazing, No. of head ...	1,547 (+25)	902 0 0	... ..	...	...	...	.....	...	Grazing ...	502 0 0
				Poles	70	700	26 0 0	Fodder, Mds. ...	28,300	450 0 0	.....	...	...	...	... ..	.	Fodder .	456 0 0
								Minor produce ...	.	4 0 0	.....	...	...	...	Timber ..	71,026	Minor produce .	4 0 0
	Timber ...	...		Total Timber ...	...	71,026	7,933 0 0											
	Firewood	6,314	...	Firewood	...	193 971	8,597 0 0								Fuel	205,953		
	Charcoal ...	...	...	Dry sticks ..	...	5,668	78 0 0											
	Total Fuel ...	6,314	...	Total Fuel ...	...	199,639	8,675 0 0											
	Total Timber and Fuel	6,314	...	Total Timber and Fuel ...	...	270,665	16,608 0 0	Total	...	1,259 0 0	.....	...	...	.	Total ...	276,979	Total ..	1,259 0 0
Permaigiri block ...	.....	...	...	Green trees	151	37,750	4,867 0 0	Bamboos, No. .	1,400	7 0 0	.....	...	.	...	.....	...	Bamboos ..	7 0 0
				Dry and fallen wood	...	8,033	1,433 0 0	Grazing, No. of head ..	1,112 (+34)	601 0 0	.....	...	...	...	.....	...	Grazing ..	691 0 0
				Poles	3	30	6 0 0	Fodder, Mds. ..	8,049	131 0 0	... ..	.	...	...	.....	. .	Fodder ...	131 0 0
								Minor produce ...	.	.	.... .	...	.	...	Timber ...	45,813	Minor produce ..	...
	Timber ...	.	...	Total Timber ...	...	45,813	6 306 0 0											
	Firewood	17,425	...	Firewood ..	..	11,753	446 0 0								Fuel	30,894		
	Charcoal	...	...	Dry sticks —	...	1,716	34 0 0											
	Total Fuel	17,425	...	Total Fuel .	...	13 469	469 0 0											
	Total Timber and Fuel	17,425	...	Total Timber and Fuel	...	59,282	6,786 0 0	Total ..	...	739 0 0	.....	..	...	...	Total	76,707	Total .	739 0 0
TOTAL OF MIM WORKING-CIRCLE. (Five years.)	... ..	...	.	Green trees ...	407	101,750	11,808 0 0	Bamboos, No. ..	2,100	10 0 0	.....	...	...	...	... ..	...	Bamboos ...	10 0 0
				Dry and fallen wood	...	14,359	2,399 0 0	Grazing, No. of head ...	2,659 (+59)	1,403 0 0	... ..	...	...	...	.....		Grazing ...	1,403 0 0
				Poles	73	730	32 0 0	Fodder, Mds. ...	36,349	581 0 0	.. ..	...	...	..	.....		Fodder ...	581 0 0
								Minor produce ...	...	4 0 0	.....	...	...	...	Timber ...	116,839	Minor produce .	4 0 0
	Timber ..	...	.	Total Timber ...	...	116,839	14,239 0 0											
	Firewood ...	23,739	.	Firewood ...	...	205,724	9,043 0 0								Fuel	236,847		
	Charcoal	...	...	Dry sticks ..	...	7,384	112 0 0											
	Total Fuel	23,739	...	Total Fuel ..	...	213,108	9,155 0 0											
	Total Timber and Fuel ...	23,739	...	Total Timber and Fuel	...	329,947	23,394 0 0	Total ...	...	1,998 0 0	.....	...	...	...	Total ...	353,686	Total ..	1,980 9 0
AVERAGE OF MIM WORKING-CIRCLE. (Per annum.)	Timber	.	...	Timber	...	23,367 8	2,847 12 10	Bamboos, No. ..	420	2 0 0	.....	...	...	...	Timber ...	23,367 8	Bamboos ...	2 0 0
	Fuel . ..	4,747 8	...	Fuel ...	...	42,631 6	1,831 0 0	Grazing, No. of head ...	531 8 (+11 8)	280 9 7	.....	...	...	...	Fuel	47,369 4	Grazing ...	280 9 7
	Timber and Fuel ..	4,747 8	...	Timber and Fuel ...	...	65,999 4	4,678 12 10	Fodder, Mds. ...	7,269 8	116 3 3	.....	...	...	...	Timber and Fuel	70,737 2	Fodder ...	116 3 3
								Minor produce ..	..	0 12 10	.....	...	...	...			Minor produce ..	0 12 10

NAGRI WORKING-CIRCLE.																			
			Fodder	Green trees ...	118	29,500	5,079 0 0	Bamboos, No. ...	400	2 0 0	.....	...	...	...	.....	...	Bamboos ..	2 0 0
			210 Mds.	Dry and fallen wood	...	7,379	1,276 0 0	Grazing, No. of head	(76)	101 0 0	.....	...	...	...	.....	...	Grazing ...	101 0 0
Rangong block ...	Timber	759	3 0 0	Poles	14	140	39 0 0	Fodder, Mds. ...	4,356	73 0 0	.....	...	...	...	.....	...	Fodder ...	76 0 0
	Fire wood	...	...					Minor produce ...	...	...	.....	...	...	...	Timber ...	37,778	Minor produce ...	
	Charcoal	...	...	Total Timber ...	...	37,019	6,394 0 0											
				Firewood and charcoal	...	32,800	1,200 0 0								Fuel	32,800		
	Total Fuel ...	...	...	Dry sticks ...	...	...	4 0 0											
				Total Fuel ...	...	32,800	1,204 0 0											
	Total Timber and Fuel	759	Total 3 0 0	Total Timber and Fuel ...	...	69,819	7,598 0 0	Total ...	...	176 0 0		...	...	...	Total ..	70,578	Total ..	179 0 0
		C. ft.	Rs. A. P.		No.	C. ft.	Rs. A. P.			Rs. A. P.	C. ft.		Rs. A. P.	Rs. A. P.		C. ft.		Rs. A. P.
			Fodder	Green trees ...	127	31,750	2,639 0 0	Bamboos, No. .	6,620	30 0 0	.....	...	...	...	.....	...	Bamboos ...	30 0 0
		.....	1,120 Mds.	Dry and fallen wood	...	9,569	1,255 0 0	Grazing, No. of head	402(+9)	209 0 0	.....	...	...	...	.....	..	Grazing ...	209 0 0
Pagraingbong block	Timber	733	18 0 0	Poles	...	..	...	Fodder, Mds. ...	5,985	92 0 0	.....	...	...	...	.....	...	Fodder ..	110 0 0
	Firewood	...	...					Minor produce ...	...	...	.....	...	...	...	Timber ...	42,052	Minor produce ..	
	Charcoal	...	...	Total Timber ...	...	41,319	3,914 0 0											
	Total Fuel ...	...	...	Firewood and charcoal	...	311,414	13,842 0 0								Fuel	311,726		
				Dry sticks ...	...	312	3 0 0											
				Total Fuel ...	...	311,726	13,845 0 0											
	Total Timber and Fuel	733	Total 18 0 0	Total Timber and Fuel	...	353,045	17,759 0 0	Total ...	...	331 0 0		...	...	...	Total ...	353,778	Total ...	349 0 0
		...	Fodder	Green trees ...	96	24,000	3,106 0 0	Bamboos, No. ...	...	...	.....	...	...	...	.....	...	Bamboos ...	
		...	396 Mds.	Dry and fallen wood	...	12,492	2,078 0 0	Grazing, No. of head ...	1,988(+71)	1,161 0 0	.....	...	...	...	.....	...	Grazing ...	1,191 0 0
Palongdong block...	Timber	1,270	6 0 0	Poles	3	30	(Nominal)	Fodder, Mds. ...	6,684	107 0 0	.....	...	...	...	.....	...	Fodder ...	113 0 0
			Minor produce 4 0 0					Minor produce ...	...	10 0 0	.....	...	...	...	Timber ...	37,792	Minor produce	14 0 0
	Firewood	2,767	...	Total Timber ...	...	36,523	5,184 0 0											
	Charcoal	185,732	...	Firewood and charcoal	...	9,923	383 0 0								Fuel	199,597		
	Total Fuel ...	189,519	...	Dry sticks ...	...	156	5 0 0											
				Total Fuel ...	...	10,078	388 0 0											
	Total Timber and Fuel	190,789	Total 18 0 0	Total Timber and Fuel	...	46,600	5,572 0 0	Total ...	...	1,278 0 0		...	...	...	Total ...	237,389	Total ...	1,288 0 0
TOTAL OF THE NAGRI WORKING-CIRCLE. (Five years.)			Fodder	Green trees ...	341	85,250	10,844 0 0	Bamboos, No. ...	6,420	32	.....	...	...	...	.....	...	Bamboos ...	32 0 0
			1,716 Mds.	Dry and fallen wood	...	29,440	4,609 0 0	Grazing, No. of head	2,390(+156)	1,471	.....	...	...	...	.....	...	Grazing ...	1,471 0 0
			27 0 0	Poles	17	170	39 0 0	Fodder, Mds. ...	17,025	272	.....	...	...	...	.....	...	Fodder ...	299 0 0
	Timber	2,762	Minor produce 4 0 0					Minor produce ...	...	10	.....	...	...	...	Timber	117,622	Minor produce...	14 0 0
	Firewood ...	2,767	...	Total Timber ...	...	114,860	15,492 0 0											
	Charcoal ...	185,732	...	Firewood and charcoal ...	...	354,136	15,425 0 0								Fuel ...	544,123		
	Total Fuel ...	189,519	...	Dry sticks ...	...	468	12 0 0											
				Total Fuel ...	...	354,604	15,437 0 0											
	Total Timber and Fuel	192,281	Total 31 0 0	Total Timber and Fuel	...	469,464	30,929 0 0	Total	...	1,785					Total ...	661,745	Total .	1,816 0 0
							Rs. A. P.			Rs. A. P.								
NAGRI OF THE NAGRI WORKING-CIRCLE. (per annum.)	Timber	552·4	...	Timber	...	22,972	3,696 6 5	Bamboos, No. ...	1,284	6 6 5	.....	...	...	...	Timber ...	23,524·4	Bamboos ..	6 6 5
	Fuel	37,903·6	Fodder	Fuel	...	70,920·8	3,087 6 5	Grazing, No. of head	478(+31·2)	294 3 2	.....	...	...	...	Fuel ...	108,924·6	Grazing ...	294 3 2
	Timber and Fuel...	38,456·2	345·2 Mds.	Timber and Fuel...	...	93,892·8	6,185 12 10	Fodder, Mds. ...	3,405	54 6 5	.....	...	...	...	Timber and Fuel	132,349	Fodder ...	59 12 10
		...	5-6-5 Minor produce. 0-12-10					Minor produce ...	...	2 0 0	.....	...	...	...	... ...	...	Minor produce ..	2 12 10

APPENDIX VI.

FOREST DEPARTMENT, BENGAL.

SCHEDULE OF RATES FOR FOREST PRODUCE.

DARJEELING FOREST DIVISION.

[*These revised rates will come into force with effect from the 1st October* 1891.]

DEPÔT SALES.

Darjeeling depôt	...	...	Firewood at Rs.	16-8	per	cord.
			Charcoal „	1-2	„	bag.
Jallapahar depôt	...	...	Firewood „	33	„	100 maunds.
			„ „	16-8	„	cord.
Goompahar depôt	...	...	Firewood „	15	„	cord.
			Charcoal „	1	„	bag.
Other Forest depôts	...	...	Charcoal „	1	„	bag.

FOREST SALES.

General conditions of purchase.

1. No tree may be felled, or wood or other forest produce be cut, collected, or removed, from any Government forest without a permit, which can be obtained from the Range Officer in whose jurisdiction the forest is, from which it is desired to obtain the material in question.

2. On the back of each permit are printed the conditions under which the permit is issued, and any infringement of these conditions constitutes an infringement of the Forest Act (VII of 1878) and is punishable accordingly.

3. Permits will be issued only after payment in full of the price of the material, calculated on the current rates. But when, as in the case of standing timber, the exact price can only be determined after felling the trees and measuring the logs, it will be sufficient to pay a deposit on account, to be estimated by the Range Officer. The permit will in this case not be filled in until later on, and will only entitle the holder to fell a given number of trees.

4. No tree may be felled, or fallen timber cut up in any Government forest, which has not been previously marked by the Range Officer with his "permit-hammer," and on which (in the case of trees) the number of the permit itself shall not have previously been impressed by the said officer at the base of the tree.

5. No timber may be removed from any Government forest without the departmental "sale mark" having been impressed thereon by the Range Officer, who will proceed to do this immediately after receiving payment in full.

6. The measurement of the timber, and the calculation of the price to be paid therefor, will be effected by the Range Officer in the presence of the purchaser or his accredited agent only; but reasonable notice in writing must be given to the Range Officer to ensure his attendance on a given date, and the purchaser or his agent should be then prepared to pay any balance due on the material, with the view to the Range Officer being able at the same time to impress the sale-hammer and to complete the permits.

7. A separate permit is necessary in the case of each timber tree or log, and it is the duty of the purchaser to see that all work in the forests can be supported then and there by permits producible on demand.

8 Permits will ordinarily be issued for two months, and on expiry of the period for which they are current, become invalid, the unremoved material reverting to Government. If renewal be desired, it may be granted under the orders and at the discretion of the Divisional Officer only, who may demand a fee for the extension of time required, not to exceed Rs. 2 for each additional day asked for.

9. Purchasers buying timber in the Government forests in the form of standing or fallen trees or logs, have no title to anything but the timber contained in such trees or logs, and may not remove any other product of such trees or logs, such as the firewood yielded by the branches or by the refuse after cutting up the logs.

10. When serious damage to neighbouring trees is likely to be caused by the fall of a tree, the purchaser, for whom such tree has been marked, should previously arrange to lessen the injury as much as possible by cutting off the main branches of the tree about to be felled, and by directing the fall of the tree in such a way as to escape, if possible, contact with all other trees. The purchaser is liable, under the Forest Act, for any avoidable grave damage to the forest.

11. All trees must be cut down within two feet of the ground, and all poles within six inches of the ground.

1.—*Timber.*

Timber will be classed as follows, and will be sold in the form of standing or fallen trees and poles only. Fashioned and seasoned timber is not kept in stock by the Department:—

Group A ... Toon, walnut and pipli.
„ B ... Champ, búk, phalát, kala siris.
„ C ... Sâl, oaks (other than búk and phalát), chestnut, lampatia.
„ D ... Chilauni, kawla, lepcha-kawla, gobria, tarsing, kabashi, utis, angaria, saj, panisaj, simul, gambari, mandania, kimbu, kainjal, sauer, mainakat, goguldhup.
„ E ... Other trees which usually attain 6 feet in girth.
„ F ... Other trees which do not usually attain 6 feet in girth.

In the Singalilà forest, champ, búk and phalát will belong to group C; fir, chestnut and oaks (other than búk and phalát) to group D; and all other large trees to group E.

Rates for trees (girth exceeding three feet at a height of four feet from the ground, or from the big end).

Group.	Green trees.		Dry trees.
	Rate per cubic foot.	Rate per tree.	Rate per cubic foot.
	Rs. A. P.	Rs. A. P.	Rs. A. P.
A	0 6 0	This class of timber is only sold by the cubic foot.	0 4 0
B	0 4 0		0 3 0
C	0 3 0		0 2 0
D	0 2 0		0 1 6
E	.....	*10 0 0	0 1 0
F	.....	*5 0 0	0 0 6

* For each additional foot or part of a foot in girth in excess of 7 feet (the girth being measured at 4 feet from the base of the tree), a further charge of 10 per cent. will be made in the case of trees belonging to classes E and F.

Rates for poles (girth at a height of four feet from the ground, or big end, being under three feet).

Group.	Girth at 4 feet from the big end.		
	Under 1 foot.	1 to 2 feet.	2 to 3 feet.
	Rs. A. P.	Rs. A. P.	Rs. A. P.
A to D ...	0 0 9 per pole.	0 1 6 per pole.	0 4 0 per pole.
Others ...	0 0 6 „	0 1 0 „	0 2 0 „

The above rates are for green poles.
Dry poles will be sold at half price.

2.—*Firewood.*

Class I contains oak and sâl.
„ II „ other woods.

Rates.

Localities.	Class I.	Class II.
	Rs. A. P.	Rs. A. P.
Goompahar, Takdah, Senchal and Mahaldaram forests.	5 0 0 per cord.	3 0 0 per cord.
Singalilà and Tista valley forests ...	3 0 0 „	1 8 0 „

Where trees belonging to both class I and class II happen to be marked for comparatively large indents for firewood, which is not required for retail sale, the Divisional Officer will decide in each case whether the firewood derived from these trees shall be stacked

and paid for separately at the higher rate, or whether all the material may be mixed together and charged for at the lower rate.

For *dry sticks* gathered by hand without the use of any cutting instrument), the rates are as follows:—

	Rs.	A.	P.
Per cooly load	0	0	3
Per 100 loads	1	6	0
Per monthly permit for 1 load daily	0	7	0
„ „ 5 „	2	0	0
„ „ 10 „	4	0	0
„ „ 20 „	7	8	0
„ „ 25 „	9	8	0
„ „ 50 „	18	0	0
„ „ 100 „	35	0	0

Special arrangements will be made by the Divisional Officer with Managers of tea gardens for the removal of the required quantity by their coolies on hât days.

3.—*Charcoal.*

Is sold only from depôts; but planters and others may make charcoal in the forests from the wood bought at firewood rates, under the following conditions:—

1. Any person wishing to make charcoal in the Government forests must send a written indent to the Divisional Forest Officer, and obtain a permit from him. The indent shall state the number of maunds or "cords" of wood required for the purpose, and shall be accompanied by one-half of the full royalty due to Government on the quantity of wood indented for. This royalty will be calculated on the rates for firewood in force for the time being. The balance of the amount due must be paid on completion of the first half of the indent.

[*Note.*—A cord of firewood (8′ × 4′ × 4′) contains 128 cubic feet of stacked wood; on an average two cords may be taken as equivalent to one hundred maunds.]

2. When all the trees marked have, in a well-defined area, been felled, and the stacking of the kilns on this area has been completed, the kilns will be measured and permission for firing them will be endorsed on the permit by the Forest Officer. After the date recorded in this endorsement, no new kilns may be made on the said area, nor may the quantity of wood in any of the kilns be increased without the Forest Officer's written permission in each case.

3. Similarly, when the burning of a certain number of kilns on a well-defined area is finished, and the permit-holder desires to begin the removal of the charcoal, permission to remove that of a specified number of kilns on such area only will be endorsed on the permit by the Forest Officer. Further removals will be authorized from time to time when all the kilns in a well-defined locality are completely burned and the charcoal ready for removal.

4. In special cases the Divisional Officer may make other arrangements than the above for the convenience of the purchaser.

4.—*Bamboos.*

Forests.	Large kinds.		Small kinds.	
	Wholesale rates.	Quantities less than 100.	Wholesale rates.	Quantities less than 100.
Singalilà	.....	.....	Annas 8 per hundred	.....
Tista Valley ...	Rupees 10 per thousand	Three for 6 pies	Rupees 4 per thousand	Three for 3 pies.
Others	.....	.....	Rupee 1 per „	.....

Special permits for making mats, baskets, gooms, &c., in the forests will be granted—

(I) The blocks north of the Rithu river and for the Rilling block of the Singalilá forest, at annas 4 per man per month.

(II) Other blocks of the Singalilà forest, at annas 8 per man per month.

(III) Tista valley forests, at annas 8 per man per month.

5.—*Fodder.*

Fodder includes creepers of all sorts, bamboo leaves, and herbaceous plants not coming under the head of "other produce."

The following trees and shrubs may be lopped for stall-feeding only:—

Prunus acuminata (Lali).
Turpinia pomifera (Thali).
Saurauja nepalensis (Gogen).

All species of Heptapleurum, Macropanax and Brassaiopsis (chindia and phuta).
Ditto of Ficus (dudhila and nebari).
Ditto of Strobilanthes (kibu).
Ditto of Rubus (aselu, phulsari).
Ditto of Polygonum (totni).

Rates:—Annas 8 per monthly permit to remove one coolie load daily, or 3 pies per coolie load.

For fodder other than bamboo, annas 4 per monthly permit, or 3 pies per cooly load.

6.—*Grazing.*

Except in the Singalilà forest, grazing is restricted in accordance with the grazing rules of October 1885 sanctioned by Government. Monthly permits for grazing in the blocks open are issued at annas 8 per cow or bullock per mensem Graziers registered under these rules may make arrangements with the Divisional Forest Officer for stall-feeding at specially reduced rates for fodder.

In the Singalilà forest, grazing is allowed in open blocks at the following rates per quarter:—

Locality.	Buffaloes.	Bullocks, cows and ponies.	Sheep and goats if specially allowed.
	Rs. A. P.	Rs A. P.	Rs. A. P.
South o Rithu river with Siri and Rimbick blocks	1 2 0	0 12 0	0 6 0
North of Rithu river, except Siri and Rimbick blocks	0 12 0	0 6 0	0 3 0

In the Tista valley forests the rates and conditions contained in the notice dated 29th April 1887 remain in force.

7.—*Other produce.**

Aconite, manjista or manjit and other products of medicinal value—rate to be fixed by agreement.

Canes (stems only)—rates Rs. 6 per man per month, or annas 5 per coolie load. The uprooting of canes is prohibited.

Turf or sods—Re. 1 per 100 square feet.

Building stone—Rs. 5 per 1,000 cubic feet (from sites to be approved by the Divisional Officer only).

Thatch-grass—3 pies per cooly load, or Re. 1-8 per 100 coolie loads.

Cow-dung— 1 anna per coolie load.

All other minor produce—4 annas per coolie load.

* *N.B.*—No restrictions are placed on the collection, consumption, and removal of produce utilizable as human food, or to the collection and removal of ornamental or medicinal plants or parts of plants, provided that no damage is done to the trees, and that the produce is not intended for purposes of trade.

Camp Cuttack,
The 19th August 1891.

E. P. DANSEY,
Conservator of Forests, Bengal.

APPENDIX VII.

Forecast of Outturn.

1.—*Enumeration of stock in the Posambing Working-Circle (Block I, approximately).*

(Mr. Chester's sample area in Balasan.)
Elevation, 6,300 to 7,500 feet.

	Area.		
	Well stocked.	Poorly stocked.	Total.
	219	118	337

Names of trees or groups.		Diameter classes in feet								Total.
		1	1½	2	2½	3	3½	4	4½	
Oaks and chestnuts	No.	986	427	259	278	136	115	179	153	2,533
	%	15·85	18·06	19·39	27·04	29·12	40·07	61·72	70·18	20·74
Champ	No.	95	86	94	85	52	39	21	13	485
	%	1·53	3 64	7·04	8·27	11·14	13·59	7·24	5·96	3·97
Maples	No.	73	59	81	94	52	23	14	4	400
	%	1·17	2·49	6·06	9 15	11·13	8·02	4·83	1·84	3·28
Kawla and Lali	No.	1,710	768	438	312	111	56	31	5	3,431
	%	27·49	32·47	32·78	30·35	23·77	19·51	10·69	2·29	28·09
Pipli	No.	...	...	...	...	...	...	...	...	...
	%	...	...	...	...	...	...	...	...	...
Chindia and Dudila	No.	541	191	90	39	15	5	2	...	883
	%	8·69	8·08	6·74	3·79	3·21	1·74	·69	...	7·23
Kharani	No.	1,053	129	24	6	4	...	...	...	1,316
	%	16·93	5·45	1·79	·58	·86	...	...	...	9·06
Others	No.	1,763	705	350	214	97	49	43	43	3,264
	%	28·34	29·81	26 20	20·82	20·77	17·07	14·83	19·73	26·73
Total ...	No.	6,221	2,365	1,336	1,028	467	287	290	218	12,212
	%	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

Diameter class.	1′	1½′	2′	2½′	3′	3½′	4′	4½′	Total.
Volume (cords)	1,555·2	1,560·9	1,776 9	2,477·5	1,433 7	1,250·9	2,047·4	1,539·1	13,650·96
Volume (cubic feet solid)	127,526	127,994	145,706	203,155	117,563	103,312	167,887	126,206	1,119,349

	Cords.	C. ft. solid.
Per acre (well stocked)	62·3	5,111

2.—*Enumeration of stock in the Posambing Working-Circle (Block II, approximately).*

(Mr. Chester's sample area in Balasan.)
Elevation, 6,300 to 7,600 feet.

	Area.		
	Well stocked.	Poorly stocked.	Total.
	414	54	468

Names of trees or groups.		Diameter classes in feet.								Total.
		1	1½	2	2½	3	3½	4	4½	
Oaks and chestnuts	No.	2,577	863	451	533	252	174	351	100	5,301
	%	10·18	14·99	15·76	23 98	29·65	46·15	67·11	67·11	18·49
Champ	No.	270	146	123	149	64	28	26	8	814
	%	1·69	2·53	4·30	6 70	7·53	7 43	4·97	5 37	2·84
Maples	No.	301	191	159	219	137	50	55	3	1,115
	%	1·89	3 32	5 56	9·85	16·12	13·26	10·52	2·01	3·89
Kawla and Lali	No.	4 248	1,763	1,034	777	227	64	42	5	8,280
	%	27·29	30·96	36·14	34·95	26 70	16·98	8·03	3·36	28·87
Pipli	No.	17	12	1	1	1	...	2	...	34
	%	·19	·21	·03	·05	·12	...	·38	...	·12
hindia and Dudila	No.	1,732	609	206	132	19	2	1	...	2,701
	%	10·87	10·58	7·20	5·94	2·23	·53	·19	...	9·42

APPENDIX VII—*continued.*

(Mr. Chester's sample area in Balasan)—*continued.*
Elevation, 6,300 to 7,600 feet.

	Area.		
	Well stocked.	Poorly stocked.	Total.
	414	54	468

Names of trees or groups.		Diameter classes in feet.								Total.
		1	1½	2	2½	3	3½		4½	
Kharani	No.	1,050	213	30	10	1	...	...	...	1,304
	%	6 59	3 70	1·05	·45	·12	...	...	...	4·55
Others	No.	5,637	1,941	857	402	149	59	46	33	9,124
	%	35·38	33 71	29·96	18 08	17·53	15 05	8·80	23 15	31·82
Total ..	No.	15,932	5,758	2 861	2,223	850	377	523	149	28,673
	%	100·00	100·00	100 00	100·00	100 00	100·00	100·00	100·00	100·00

Diameter classes.	1′	1½′	2′	2½′	3′	3½′	4′	4½′	Total.
Volume (cords)	3,983 0	3,800 3	3,805 1	5,357·4	2,009·5	1,055 0	3,692·0	1,051·9	25,954·6
Volume (cubic feet solid)	326,606	311,625	312,018	439,307	213,970	135,710	302,777	86,256	2,128,278

	Cords.	C. ft. solid.
Per acre (well stocked)	62·7	5,141

3.—*Enumeration of stock in the Mim Working-Circle (Block III and part of IV).*

(Mr. Chester's sample area in Permaigiri.)
Elevation, 6,000 to 7,500 feet.

	Area.		
	Well stocked.	Poorly stocked.	Total.
	293	14	307

Names of trees or groups.		Diameter classes in feet.								Total.
		1	1½	2	2½	3	3½	4	4½	
Oaks	No.	441	253	166	309	98	108	126	59	1,650
	%	3 51	6·02	8·45	16 42	15·90	30·51	36·52	50 43	7·31
Chestnut	No.	225	107	56	130	57	53	73	24	725
	%	1·79	2 55	2·85	5·35	9·28	14·97	21·16	20·51	3·21
Champ	No.	211	140	100	188	76	43	37	14	809
	%	1·68	3·33	5·09	7·74	12·38	12·15	10·72	11 97	3 58
Maples	No.	317	215	182	330	110	47	23	4	1,228
	%	2 53	5 12	9·27	13·58	17 91	13 28	6 67	3 42	5·44
Kawla and Lali	No.	3,560	1,192	643	613	128	38	25	5	6,204
	%	28·34	28·37	32 74	25·23	20 85	10·73	7·25	4·27	27·47
Pipli	No.	10	9	4	8	2	2	3	1	39
	%	·08	·21	·20	·33	·33	·57	·87	·85	·17
Chindia and Dudila	No.	1,316	361	97	62	2	...	1	...	1,839
	%	10·48	8 59	4·94	2·55	·33	...	·29	...	8·14
Kharani	No.	931	113	11	4	3	1	...	...	1,063
	%	7·41	2·66	·56	·16	·49	·28	...	...	4·70
Others	No.	5,550	1 813	705	696	138	62	57	10	9,071
	%	44·18	43·15	35·90	28 64	22 47	17·51	16·52	8·55	30 98
Total ...	No.	12,561	4,202	1,964	2,430	614	354	345	117	22,587
	%	100·00	100·00	100·00	100 00	100·00	100·00	100·00	100·00	100·00

Diameter classes.	1′	1½′	2′	2½′	3′	3½′	4′	4½′	Total.
Volume (cords)	2,140·2	2,773·3	2,612·1	5,856·3	1,885·0	1,554·1	2,433·7	826·0	21,082·7
Volume (cubic feet solid)	257,490	227,411	214,193	480,217	154,570	127,436	199,727	67,733	1,728.781

	Cords.	C. ft. solid.
Per acre (well stocked) ...	71·9	5,900

range, but they are not so high and they have a more rounded and undulating outline. The highest peak is Karakata, which is a land-mark for all the country round, as it rises in dome-shaped prominence from the block of hills constituting the group.

Geologically, the Ramgarh Hills are interesting, both the Dubrajpur and Barakar subdivisions of the Gondwana system being represented in them. The Dubrajpur subdivision is found in a narrow strip with faulted western boundary along the western border of the range. It consists of coarse grits and conglomerates, often ferruginous, containing quartz and gneiss pebbles, with occasionally hard and dark ferruginous bands. It is unconformably overlaid by the Rajmahal group, consisting chiefly of bedded basic volcanic lavas of the nature of dolerites and basalts. Basic dykes scattered through the gneiss area represent the underground portion of these eruptions. Intercalate between successive lava flows are aqueous, sedimentary layers containing fossil plants similar to those found near Jubbulpore and in Cutch.

OTHER HILL RANGES

Further west two parallel ranges of hills stretch in an easterly direction from Mosanjor to Ranibahal. They present a landscape of considerable beauty as seen from the Mosanjor bungalow, which looks out on a picturesque grouping of hills and dales said to rival the hills of the Damin-i-koh in its effects. These ranges, after crossing the Mor at Ranibahal, form the Satgarh group in *taluk* Muhammadabad, north of Jagdishpur, and finally merge into the Sapchala hills, one of a group of ranges passing through *taluks* Sapchala, Lakshanpur, Sankara and Kumrabad, which attain a considerable height in the two *taluks* first named. The Sapchala range breaks up into isolated hillocks after crossing the Nunbil river; and north of it, near Dumka, there are a number of other detached hills, which rise abruptly from the plains in sharp conical masses. The most important of these are the Lagwa hills near Nunihat and the Mikra hills on the borders of the Deoghar subdivision.

APPENDIX VII—*continued.*

Sample area in Pagraingbong—*continued.*
Elevation, 5,500 to 6,400 feet.

Area.		
Well stocked.	Poorly stocked.	Total
70	80	150

Names of trees or groups.		Diameter classes in feet.								Total.
		½	1	1½	2	2½	3	3½	4	
Walnut	No.	3	..	1	.	...	...	...	...	4
	%	·04	...	·09	...	...	...	..	...	·03
Tún	No.	32	14	9	5	2	1	1	1	65
	%	·42	·07	·82	·83	·87	1·11	2·08	·52	·55
Unclassed	No.	2,279	407	152	51	8	3	1	3	2,904
	%	30 19	19 60	13 89	8 47	3·49	3 34	2·08	1 56	24 44
Total	No.	7,550	2,077	1,094	602	229	90	48	193	11,882
	%	100 00	100·00	100 00	100 00	100 00	100 00	100 00	100 00	100 00

Diameter classes.	½′	1′	1½′	2′	2½′	3′	3½′	4′	Total.
Volume (cords)	377·5	648·9	722·0	800·7	551·9	276·8	210·7	1,355·5	4,938·5
Volume (cubic feet solid)	30,965	52,800	59,204	65,657	45,256	22,667	17,277	111,151	404,957

	Cords.	C. ft solid.
Per acre (well stocked) ...	70·9	5,785

5.—*Enumeration of stock in the Nagri Working-Circle (Block II and part of V).*

(Mr. Chester's sample area in Palongdong.)
Elevation, 6,000 to 7,500 feet.

Area.		
Well stocked.	Poorly stocked.	Total.
47	202	249

Names of trees or groups.		Diameter classes in feet.								Total.
		1	1½	2	2½	3	3½	4	4½	
Oaks	No.	3,360	1,121	534	787	289	274	470	357	7,192
	%	12·10	12·13	12 48	20·25	21 78	24·71	43 68	46 12	14 54
Chestnut	No.	796	334	238	209	134	286	192	133	2,414
	%	2·88	3 61	5 56	7 09	10·07	25 79	17 85	17 18	4 88
Champ	No.	672	376	272	283	146	113	72	52	1,986
	%	2 42	4 07	6 36	7·28	11 13	10 19	6 69	6·72	4·02
Maples	No.	343	252	245	295	138	70	68	27	1,438
	%	1 30	2 73	5 73	7·59	10·38	6 31	6 32	3·49	2 95
Kawla and Lali	No.	7,464	2,742	1,333	1 034	301	193	76	32	13,175
	%	26 89	29 66	31·15	26·60	22 63	17 40	7·06	4 13	26 64
Pipli	No.	10	4	1	1	3	1	..	3	23
	%	·04	·04	·02	·03	·23	·09	..	·39	·05
Chindia and Dudila	No.	2,007	829	323	151	27	7	8	2	3,354
	%	7·23	8 97	7 55	·388	2·03	·63	·74	·26	6 78
Kharani	No.	3,598	484	68	12	7	1	1	...	4,171
	%	12 96	5 24	1 59	·31	·52	·09	·09		8 43
Others	No.	9,487	3,103	1,265	1 025	283	164	189	166	15,683
	%	34 18	33 56	29 56	26 37	21·28	14 79	17 57	21·71	31 71
Total	No.	27,759	9,244	4,279	3,887	1,330	1,109	1,076	774	49,458
	%	100 00	100·00	100 00	100·00	100 00	100 00	100·00	100·00	100·00

Diameter class.	1′	1½′	2′	2½′	3′	3½′	4′	4½′	Total.
Volume (cords)	6 930·7	6,101	5,681	9 307·6	4,083 1	4 898·5	7,390·6	5 464 4	50,111·9
Volume (cubic feet solid)	569,055	500,282	466,662	763,143	334,814	399,217	632,921	448,081	4,109,176

	Cords.	C. ft. solid.
Per acre (wel stocked) ...	77·4	6 35

APPENDIX VII—*continued.*

6.—*Enumeration of stock in the Nagri Working-Circle (Block V, part).*

Sample area in Palongdong.
Elevation, 6,000 to 6,500 feet.

	Area.		
	Well stocked.	Poorly stocked.	Total.
	120	100	220

Names of trees or groups.		Diameter classes in feet.								Total.
		½	1	1½	2	2½	3	3½	4	
Buk	No.	38	26	20	13	9	8	26	44	184
	%	·21	·90	1·38	1 82	3·31	6 06	18·98	16 07	·78
Phalát	No.	21	12	17	15	6	4	4	4	83
	%	·12	·41	1·17	2·10	2 20	3·03	2·92	1·51	·35
Katus	No.	204	74	64	47	25	22	27	51	514
	%	1·15	2 55	4 42	6 59	9 19	16 67	19·70	19·52	2·17
Other oaks	No.	118	47	17	3	...	...	...	...	185
	%	·66	1·62	1·17	·42	...	.	..	. .	·78
Safed champ	No.	82	70	55	40	20	9	4	7	287
	%	·46	2·41	3 80	5·61	7·35	6·82	2 92	2·65	1 21
Other Magnolias	No.	69	47	35	16	5	1	...	...	173
	%	·30	1·62	2·42	2 25	1·84	·76	...	...	·73
Kabashi	No.	119	49	31	27	9	5	6	3	249
	%	·67	1·69	2·14	3·79	3·31	3·79	4·38	1·14	1·05
Kawla	No.	326	121	117	100	24	15	4	10	717
	%	1·83	4·17	8 08	14·03	8 82	11·36	2·92	3·79	3·03
Paioli	No.	83	41	14	4	1	2	1	...	146
	%	·47	1·41	·97	·56	·37	1·51	·73	...	·62
Lepchakawla	No.	44	16	26	28	14	9	12	19	168
	%	·25	·55	1 79	3 93	5·15	6·82	8·76	7 20	·71
Sisi	No.	275	108	76	40	14	4	1	1	519
	%	1·55	3 73	5·25	5·61	5·15	3 03	·73	·38	2·19
Tarsing	No.	110	54	44	30	17	8	6	5	274
	%	·62	1·86	3 04	4·21	6·25	6·06	4·38	1 89	1·16
Other Laurels	No.	286	120	54	10	4	1	...	...	475
	%	1 61	4 14	3 73	1·40	1·47	·76	...	...	2·01
Chilauni	No.	103	78	79	53	30	7	12	13	374
	%	·57	2·69	5·46	7·43	11 03	5·30	8·76	4·92	1 58
Dabdabi	No.	134	21	21	10	7	5	2	...	200
	%	·75	·73	1·45	1·40	2·57	3·79	1·46	...	·84
Gokria	No.	76	59	40	39	14	11	18	85	342
	%	·43	2·03	2 76	5 47	5·15	8 33	13 14	32 20	1·45
Bhadrasi	No.	76	40	43	17	11	5	4	4	200
	%	·43	1·38	2 97	2·39	4·04	3·79	2·92	1 51	·84
Pipli	No.	2	...	1	1	...	...	...	3	7
	%	·01	...	·07	·14	...	...	...	1·14	·03
Mya	No.	8	4	4	1	...	...	...	..	17
	%	·04	·14	·27	·14	...	...	...	..	·07
Arupati	No.	29	15	17	7	5	...	...	. .	73
	%	·16	·52	1·17	·98	1·84	...	...	...	·31
Lah	No.	381	168	42	4	...	...	...	...	595
	%	2·14	5 79	2·90	·56	...	...	...	...	2·51
Thai	No.	339	137	33	2	...	...	...	...	511
	%	1·90	4 72	2·28	·28	...	...	...	...	2·16
Chindia	No.	245	169	163	97	30	10	3	2	719
	%	1 38	5·83	11·26	13 61	11·03	7·57	2·19	·76	3·04

APPENDIX VII—*continued.*

Sample area in Palongdong—*continued.*
Elevation, 6,000 to 6,500 feet.

Area.		
Well stocked.	Poorly stocked.	Total.
120	100	220

Names of trees or groups.		Diameter classes in feet.								Total.
		½	1	1½	2	2½	3	3½	4	
Jhingni	No.	1,482	72	19	4	...		..	...	1,577
	%	5 33	2·48	1·31	·56	...			...	6 66
Symplocos	No.	7,886	604	57	4	...	...	.	...	8,551
	%	44 30	20·82	3·94	·56	..	...	...	...	36·13
Barkholi	No.	1,530	109	35	13	8	1	1	...	1,697
	%	8·59	3·76	2 42	1 82	2 94	·76	·73	...	7·17
Dudila	No.	93	47	34	3	1	1	..	. .	179
	%	·52	1·62	2·35	·42	·37	·76	...	...	·76
Unclassed	No.	3,636	591	290	85	18	4	5	12	4,641
	%	20 42	20·37	20 03	11 92	6 62	3 03	3·65	4·54	19 01
Tún	No.	8	2	...	...	...	...	1	1	12
	%	·04	·07	...	...	..	...	·73	·38	·05
Total ...	No.	17,802	2,901	1,448	713	272	132	137	264	23,669
	%	100·00	100·00	100 00	100·00	1000·0	100 00	100 00	100 00	100·00

Diameter class.	½'	1'	1½'	2'	2½'	3'	3½'	4'	Total.
Volume (cords)	890·1	899 3	955·7	943·3	655·5	405·2	601·4	1,863 8	7,219·3
Volume (cubic feet solid)	72,988	73,743	78,367	77,761	53,751	33,226	49,315	152,831	591,982

	Cords.	C. ft. solid.
Per acre (well stocked)	60·1	4,933

7.—*Enumeration of stock in the Senchal Working-Circle (Block I, part).*

(Mr. Chester's sample area in Rangirum and part of Dawalpani.)
Elevation 5,800 to 7,200 feet.

Area.		
Well stocked.	Poorly stocked.	Total.
782	..	782

Names of trees or groups.		Diameter classes in feet.								Total.
		1	1½	2	2½	3	3½	4	4½	
Oaks	No.	3,910	1,385	897	1,176	374	305	459	299	8,805
	%	12 28	12·18	15·16	19 09	20·92	23 79	34 77	27·82	14 49
Chestnut	No.	793	198	182	362	159	148	242	223	2,307
	%	2 49	1·74	3·07	5 88	8 89	11·54	18 33	20 74	3·80
Champ	No.	395	295	279	343	125	132	66	61	1,686
	%	1 24	2 59	4 71	5·40	6 99	10 30	5·00	5·67	2 77
Maples	No.	980	611	437	699	227	102	152	74	3 291
	%	3·11	5 37	7 38	11·35	12 70	7·96	11·51	6 88	5 42
Kawla and Lali ...	No.	6,016	3,060	1,731	1,498	342	184	109	43	13,883
	%	21 72	26 90	29 25	24 31	19·13	14·35	8 26	4 00	22 85
Pipli	No.	10	9	6	8	4	3	5	4	49
	%	·03	·08	·10	·13	·22	·24	·38	·37	0 08
Chindia and Dudila	No.	879	450	228	159	27	9	1	3	1,756
	%	2 76	3 96	3 85	2 58	1·51	·70	08	·28	2 89
Kharani	No.	4,157	443	135	133	53	14	10	2	4,947
	%	13 05	3 89	2·28	2·16	2 96	1 09	·76	·19	8·14

APPENDIX VII—*continued.*

(Mr. Chester's sample area in Rangirum and part of Dawaipani.)

Elevation, 5,800 to 7,200 feet—*continued.*

Area.		
Well stocked.	Poorly stocked.	Total.
782	...	782

Names of trees or groups.		Diameter classes in feet.								Total.
		1	1½	2	2½	3	3½	4	4½	
Others	No.	13,793	4,925	2,024	1,793	477	385	276	366	24,039
	%	43 32	43 29	34 20	29·10	26 68	30 03	20 91	34 05	39·56
Total .	No.	31,842	11,376	5,919	6,161	1,788	1,282	1,320	1,075	60,763
	%	100 00	100 00	100·00	100 00	100·00	100 00	100·00	100 00	100·00

Diameter class.	1′	1½′	2′	2½′	3′	3½′	4′	4½′	Total.
Volume (cords)	7,960·5	7,508·2	7,672 3	14,848 0	5,489·1	5,028 0	9,319·2	7,580·5	66,214·8
Volume (cubic feet solid)	652,761	615,672	645,529	1,217,536	450,106	461,406	764,174	622,330	5,429,613

	Cords.	C. ft. solid.
Per acre	84·7	6,943

8.—*Enumeration of stock in the Senchal Working-Circle (Block I).*

Stock remaining on the ground after felling in the coupe of 1889-90 at Rangirum.

Elevation, 6,000 to 6,500 feet.

Area.		
Well stocked.	Poorly stocked	Total.
35½	...	35½

Names of trees or groups.		Diameter classes in feet.								Total
		½	1	1½	2	2½	3	3½	4	
Buk	No.	8	4	4	3	2	1	1	5	28
	%	·20	·70	1·50	1·38	1·50	2·33	3 45	10·21	·53
Phalát	No.	14	4	3	9	12	1	...	2	45
	%	·36	·70	1·12	4·13	9·02	2 33	...	4·08	·86
Katus	No.	33	6	4	3	2	5	4	1	58
	%	·84	1·06	1·50	1·38	1·50	11 63	13·79	2·04	1·11
Other oaks and chestnuts	No.	23	4	2	..	...	...	...	...	29
	%	·58	·70	·75	...	...	...	...	...	·55
Safed champ	No.	4	7	5	3	2	1	1	...	23
	%	·10	1·23	1·87	1·38	1 50	2·33	3 45	...	·44
Other Magnolias	No.	30	11	11	17	9	4	...	...	82
	%	·76	1·94	4·12	7·80	6·77	9·30	...	...	1·56
Maples	No.	59	20	19	20	10	4	3	...	135
	%	1·49	3 52	7·12	9·17	7·52	9·30	10·34	...	2·57
Kawla	No.	102	55	38	27	12	2	...	1	237
	%	2·58	9·68	14·23	12·38	9·02	4·65	...	2·04	4·51
Puieli	No.	44	18	7	2	1	...	...	...	72
	%	1·12	3·17	2·62	·92	·75	...	...	...	1·37
Lepchakawla	No.	41	34	28	31	18	5	2	4	163
	%	1·04	5·99	10 49	14·22	13 54	11·63	6 90	8·16	3·10
Other Laurels	No.	4	1	1	...	...	...	...	...	6
	%	·10	·18	·37	...	...	...	...	...	·11
Chilauni	No.	18	3	6	8	6	4	3	...	8
	%	·46	·53	2·25	3·67	4·51	9·30	10·34	...	·01
Dabdabi	No.	23	5	2	11	3	1	...	2	47
	%	·58	·88	·75	5·04	2·26	2·32	...	4·08	·89
Gobria	No.	27	17	7	7	19	9	6	20	128
	%	·68	2 99	2·62	3·21	14·29	20 93	20·69	81·23	2·32

APPENDIX VII—*continued.*

Stock remaining on the ground after felling in the coupe of 1889-90 at Rangirum. Elevation, 6,000 to 6,500 feet—*continued.*

Area.		
Well stocked.	Poorly stocked.	Total.
35½	...	35½

Names of trees or groups.		Diameter classes in feet.								Total.
		½	1	1½	2	2½	3	3½	4	
Bhadrasi	No.	9	8	8	7	...	...	1	...	33
	%	·23	1·41	2·99	3·21	...	...	3·45	...	·63
Arupati and Puddum ...	No.	45	30	13	15	10	2	1	...	116
	%	1·14	5·28	4·87	6·88	7·52	4·65	3·45	...	2·21
Lali	No.	94	12	2	1	...	...	...	...	109
	%	2·38	2·11	·75	·46	...	...	...	...	2·08
Thali	No.	130	53	12	...	...	...	...	...	195
	%	3·29	9·33	4·49	...	...	...	...	...	3·71
Chindia	No.	51	38	30	11	9	...	...	2	141
	%	1·29	6·69	11 24	5·05	6·77	...	...	4·08	2·68
Ficus (Dudila, &c.)	No.	76	11	2	2	1	...	...	...	92
	%	1·93	1·94	·75	·92	·75	...	...	...	1·75
Symplocos	No.	2,446	42	...	2	1	...	...	...	2,491
	%	61·96	7·39	...	·92	·75	...	...	...	47·40
Jhingni	No.	60	18	...	1	...	...	...	...	79
	%	1·52	3·17	...	·46	...	...	...	...	1·50
Tarsing	No.	25	14	7	8	5	1	...	...	60
	%	·63	2·47	2·62	3·67	3·76	2·32	...	...	1·14
Sisi	No.	110	33	30	21	5	...	2	...	201
	%	2·79	5·81	11·24	9·63	3·76	...	6·90	...	3·83
Pipli	No.	...	...	...	...	...	...	1	1	2
	%	...	...	...	...	...	...	3·45	2·04	·04
Mya	No.	6	5	...	1	...	...	...	...	12
	%	·15	·88	...	·46	...	...	...	...	·23
Barkholi	No.	66	20	11	4	4	3	3	1	112
	%	1·67	3·52	4·12	1·83	3·01	6 98	10·34	2 04	2·13
Unclassed	No.	400	95	15	4	2	...	1	...	517
	%	10·13	16·73	5 62	1·83	1·50	..	3·45	...	9·84
Total ...	No.	3,948	566	267	218	133	43	29	49	5,255
	%	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

Diameter class.	½'	1'	1½'	2'	2½'	3'	3½'	4'	Total.
Volume (cords)	197·40	176·1	176·2	289·0	320·5	132	127·3	345 9	1,765·3
Volume (cubic feet solid)	16,187	14,440	14,448	23,772	26,281	10,824	10,439	28,364	144,755

	Cords.	C. ft. solid.
Per acre	49·7	4,077

9.—*Enumeration of stock in the Senchal Working-Circle (Block I).*

Stock remaining on the ground after felling in the coupe of 1890-91 at Rangirum. Elevation 6,000 to 6,500 feet.

Area.		
Well stocked.	Poorly stocked.	Total.
35	5	40

Names of trees or groups.		Diameter classes in feet.								Total.
		½	1	1½	2	2½	3	3½	4	
Buk	No.	5	...	2	2	1	...	1	5	16
	%	·11	...	·55	·63	·50	...	3·23	5·10	·36
Phalát	No.	2	...	...	3	1	5	..	...	11
	%	·04	...	...	·94	·50	6·76	...	...	·10

APPENDIX VII—*continued.*

Stock remaining on the ground after felling in the coupe of 1890-91 at Rangirum.

Elevation, 6,000 to 6,500 feet—*continued.*

Area.		
Well stocked.	Poorly stocked.	Total.
35	5	40

Names of trees or groups.		Diameter classes in feet.								Total.
		½	1	1½	2	2½	3	3½	4	
Katus	No.	19	5	1	3	5	3	1	7	44
	%	·43	·77	·27	·94	2·47	4·05	3·23	7·15	·71
Other oaks and chestnuts	No.	7	1	1	...	...	1	...	...	10
	%	·16	·15	·27	...	..	1·35	...	...	·16
Safed champ	No.	11	2	5	4	6	1	...	1	30
	%	·25	·31	1·37	1·26	2·97	1·35	...	1·02	·49
Other Magnolias	No.	26	8	12	15	14	7	2	1	85
	%	·59	1·22	3·28	4·72	6·93	9·46	6·45	1·02	1·38
Maples	No.	68	35	23	24	26	4	1	2	183
	%	1·53	5·35	6·28	7·55	12·87	5·41	3·23	2·04	2·96
Kawla	No.	106	39	53	36	27	3	1	2	267
	%	2·39	5·96	14 48	11·32	13·37	4·06	3·23	2·04	4·32
Paloli	No.	98	79	12	5	...	...	...	...	194
	%	2 21	12·08	3·28	1·57	...	...	...	...	3·14
Lepchakawla	No.	45	29	55	61	48	14	6	8	266
	%	1·01	4·43	15 03	19 18	23·76	18·92	19·35	8·16	4·31
Other Laurels	No.	37	1	2	...	...	...	...	...	40
	%	·83	·15	·55	...	...	...	...	...	·65
Chilauni	No.	8	1	3	5	3	3	...	2	25
	%	·18	·15	·82	1·57	1·40	4·05	...	2·04	·40
Dabdabi	No.	60	3	7	10	6	2	...	...	88
	%	1·35	·46	1·91	3·14	2·97	2 70	...	...	1·42
Gobria	No.	66	57	26	34	24	18	12	65	302
	%	1·49	8·72	7·10	10 69	11·88	24 33	38·71	66·33	4 89
Bhadrasi	No.	6	1	2	3	2	1	1	...	16
	%	·13	·15	·55	·94	·99	1·35	3·22	...	·26
Arupati and Puddum	No.	95	63	42	37	18	6	...	2	263
	%	2·14	9·63	11·47	11·63	8·91	8·11	...	2 04	4 26
Lali	No.	81	17	...	...	...	...	...	...	98
	%	1·83	2·60	...	...	...	...	...	...	1·59
Thali	No.	128	63	14	1	...	...	...	...	206
	%	2 89	9·63	3·83	·32	...	...	...	...	3 33
Chindia	No.	70	32	30	21	2	1	...	...	156
	%	1·58	4·89	8·20	6 60	·99	1·35	...	...	2·52
Ficus (Dudila, &c.)	No.	187	6	7	3	2	...	...	...	205
	%	4 22	·92	1 91	·94	·99	...	...	...	3 32
Symplocos	No.	1,925	62	3	1	...	...	...	.	1,991
	%	43 40	9·48	·82	·32	...	...	...	...	32 22
Jhingni	No.	60	8	2	...	...	...	...	...	70
	%	1 35	1·22	·55	...	...	.	...	...	1·13
Tarsing	No.	30	21	14	8	8	3	3	1	97
	%	·68	3·21	3 83	2 52	3·96	4·05	9·68	1·02	1·57
Sisi	No.	46	21	20	24	5	1	1	...	118
	%	1·04	3 21	5 46	7·55	2 47	1·35	3·22	...	1·91
Pipli	No.	2	2	...	1	...	...	...	...	5
	%	·04	·31	...	·32	..	...	...	...	·08
Mya	No.	...	2	...	1	...	...	...	1	4
	%	...	·31	...	·32	...	...	...	1·0	·06

APPENDIX VII—*continued.*

Stock remaining on the ground after felling in the coupe of 1890-91 at Rangirum.
Elevation, 6,000 to 6,500 feet.

	Area.		
	Well stocked.	Poorly stocked.	Total.
	35	5	40

Names of trees or groups.		Diameter classes in feet.								Total.
		½	1	1½	2	2½	3	3½	4	
Barkholi	No.	114	26	13	9	3	1	2	1	169
	%	2 57	3·98	3 55	2·83	1 48	1·35	6·45	1·02	2 73
Unclassed	No.	1,125	70	17	7	1	...	...	...	1,220
	%	25 36	10 71	4 64	2·20	·50	...	...	...	19·75
Total ...	No.	4,436	654	366	318	202	74	31	98	6,179
	%	100 00	100 00	100 00	100 00	100 00	100·00	100 00	100·00	100 00

Diameter class.	½′	1′	1½′	2′	2½′	3′	3½′	4′	Total.
Volume (cords)	221·8	202·7	241·6	422·9	486 8	227 2	136·1	691·9	2 631
Volume (cubic feet solid)	18,168	16,621	19,811	34,678	39,918	18,630	11,160	56,736	215,742

	Cords.	C. ft. solid.
Per acre (well stocked)	75·2	6,164

10.—*Enumeration of stock in the Senchal Working-Circle (Block I, coupe of* 1891-92).

Sample area in Rangirum.
Elevation, 6,500 to 7,250 feet.

	Area.		
	Well stocked.	Poorly stocked	Total.
	90	4½	94½

Names of trees or groups.		Diameter classes in feet.								Total.
		½	1	1½	2	2½	3	3½	4	
Buk	No.	84	24	22	32	27	20	13	77	308
	%	·62	·81	1·46	3 62	6·77	13·12	13 27	24 12	1·55
Phalát	No.	15	12	14	17	12	7	3	4	84
	%	·11	·40	·93	1·92	3 01	3·17	3 06	1·29	·42
Katus	No.	81	23	21	16	13	21	8	49	232
	%	·60	·77	1 39	1 81	3 26	9·50	8·17	15 86	1·17
Other oaks	No.	24	6	1	...	...	1	1	...	·33
	%	·17	·20	·07	...	...	·45	1·02	...	·17
Safed champ	No.	9	6	9	18	8	10	3	5	68
	%	·06	·20	·60	2·03	2 00	4 53	3 06	1·62	·34
Other Magnolias	No.	14	9	23	18	11	4	3	4	86
	%	10	·30	1·52	2 03	2·76	1·81	3·06	1·29	43
Maples	No.	193	56	69	69	44	26	17	56	530
	%	1 42	1·88	4·57	7 80	11·03	11·77	17·35	18·12	2 66
Kawla	No.	710	400	277	185	85	40	6	15	1,727
	%	5 25	13 75	18 33	20 91	21 30	18 10	6 12	4·85	8·67
Paiell	No.	461	238	102	54	10	5	1	...	871
	%	3 41	8·00	6 75	6 10	2 51	2·26	1·02	..	4 37
Lepchakawla	No.	10	5	2	3	3	2	...	...	25
	%	·07	·17	·13	·34	·75	·91	..	...	·13
Tarsing	No.	42	28	27	25	8	5	2	2	139
	%	·31	·94	1 79	2 83	2 00	2·26	2·04	·63	·70
Sisi	No.	439	196	115	75	22	7	6	11	871
	%	3 24	6 59	7 61	8 48	5·51	3 17	6 12	3 56	4·37
Other laurels	No.	69	22	6	2	...	...	...	...	99
	%	·51	·74	·40	23	...	...	...	...	·50

APPENDIX VII—*concluded.*

Sample area in Rangirum.

Elevation, 6,500 to 7,250 feet—*continued.*

Area.		
Well stocked.	Poorly stocked.	Total.
90	4½	94½

Names of trees or groups.		Diameter classes in feet.								Total.
		½	1	1½	2	2½	3	3½	4	
Chilauni	No.	19	3	..	1	...	..	1	...	24
	%	·14	·10		·11	...	..	1 03	...	·12
Dabdabi	No.	52	9	9	13	10	6	2	13	114
	%	·38	·30	·60	1 47	2 51	2·71	2 04	4 21	·57
Gobria	No.	17	9	15	10	11	6	6	32	106
	%	·12	·30	·99	1 13	2 76	2 71	6 12	10 36	53
Khadrasi	No.	38	38	41	37	15	10	7	13	199
	%	·28	1 28	2 71	4·18	3 76	4 53	7·15	4 21	1 00
Arupati	No.	232	108	80	64	29	15	5	5	535
	%	1 70	3 63	5·29	7·12	7 27	6 79	5 06	1 62	2 69
Lali	No.	1,157	361	61	16	4	...	...	...	1,599
	%	8 56	12 14	4 04	1 81	1 00	...	...	...	8 03
Pipli	No.	8	3	1	6	3	4	4	7	36
	%	·06	·10	·07	·68	·75	1 81	4·08	2 27	·18
Mya	No.	92	39	40	10	2	1	.	3	187
	%	·68	1 31	2 65	1 13	·50	·45	...	·97	94
Thali	No.	633	485	148	37	2	...	1	...	1 306
	%	4·68	16 31	9·79	4 18	·50	...	1·02	...	6 56
Chindia	No.	184	109	121	68	34	8	2	5	531
	%	1 36	3 67	8 00	7 68	8 52	3 62	2·04	1 62	2 67
Ficus	No.	212	135	81	25	10	2	...	1	466
	%	1 57	4 54	5 36	2 81	2 51	·91	..	·32	2 34
Kharani	No.	4,608	134	12	2	1	1	...	...	4,848
	%	34 76	4 51	·79	·23	·25	·45	.	...	24 35
Kolmo	No.	353	159	26	10	1	1	..	...	550
	%	2 61	5 35	1 72	1 13	·25	·45	...	...	2 76
Jhingni	No.	147	58	12	4	1	...	..	...	222
	%	1 08	1·95	·79	·45	·25		..	...	1 12
Barkholi	No.	81	18	17	7	10	4	2	1	140
	%	·60	·61	1·13	·79	2 51	1 81	2 04	·32	·70
Unclassed	No.	3,442	272	150	62	23	6	7	6	3,977
	%	25 46	9 15	10 52	7 00	5 76	2 71	7·14	1·94	19 97
Grand Total	No.	13,516	2,974	1,511	885	399	221	98	309	19,913
	%	100 00	100 00	100 00	100 00	100 00	100 00	100 00	100 00	100·00

Diameter class.	½'	1'	1½'	2'	2½'	3'	3½'	4'	Total.
Volume (cords)	675 8	921·9	997 3	1,177·0	961 6	678 5	480·2	2 181·5	8,023·8
Volume (cubic feet solid)	55,410	75,596	81,780	96,514	78,851	55,637	35,276	178,883	657,953

	Cords.	C. ft. solid.
Per acre (well stocked)	89 1	7,311

APPENDIX VIII.

Estimation of contents of type trees

Diameter-class I.

Serial number.	Species.	Situation, soil, &c.	Soundness.	Cubic contents (stacked wood), cubic feet.	Equivalent in cords.
1	Arupati ...	Gentle slope, good soil, aspect N.-W. ...	Sound ..	13	·10
2	Kharani ...	Ditto, ditto ...	Do. .	4⅜	·03
3	Ditto ...	A flat spot, good soil, aspect N.-W. ...	Do. ...	9	·07
4	Lali ...	Moderate slope, good soil, aspect N.-W. Beneath a clump of sisi ...	Do. ...	6¾	·05
5	Chindia ...	Rocky soil, aspect N.-W. ...	Do. ...	6½	·05
6	Kawla ..	Gentle slope, good soil, aspect N.-W. ..	Small hollow ...	2½	·02
7	Sisi ...	Steep slope, rocky soil, aspect W. ...	Sound ..	1⅛	·01
8	Barkholi ...	Gentle slope, good soil and forest, aspect N.-W.	Do. ...	10⅛	·08
9	Kharani ...	Ditto ditto ...	Do. ...	3⅓	·03
10	Ditto ...	Good soil, gentle slope, aspect N.-W. ..	Do. ...	5⅛	·04
11	Thali ...	Moderate slope, rocky soil, aspect N.-W.	Do. ...	12	·09
12	Kharani ...	Good soil, gentle slope, aspect N.-W. ...	Do. ...	2¾	·02
13	Ditto ...	Ditto, ditto ...	Do. ...	7¼	·06
14	Paieli ...	Ditto, ditto ...	Do. ..	4⅔	·04
15	Arupati ...	Ditto, ditto ...	Do. ...	17¼	·13
16	Phalát ...	Ditto, ditto ...	Do. ...	5¾	·04
17	Kharani ...	Ditto, ditto ..	Do. ...	2⅓	·02
18	Paieli ...	Moderate slope, aspect N.-W. ...	Unsound ...	5⅘	·05
19	Kawla ...	Ditto, ditto ...	Ditto ...	4⅛	·03
20	Do. ...	Gentle slope, aspect N.-W. ...	Sound ..	11	·09
			Total ...	135½	1·05
			Average ...	6·78	·05
				Maunds	2·50

Estimation of contents of type trees.

Diameter-class II.

1	Paieli ...	Good soil, gentle slope, aspect N.-W. ...	Sound ...	20	·16
2	Thali ...	Good soil, on ridge, aspect N. ...	Do. ...	37	·29
3	Do. ...	Good soil, aspect N.-W. ...	A little hollow ...	18⅛	·14
4	Phota ...	Near jhora, aspect N.-W. ...	A little unsound ...	26¼	·21
5	Sisi ...	Slope moderate, good soil, growing in clump.	Slight rot ...	36	·28
6	Kharani ...	Medium slope, aspect N.-W. ...	Sound ...	40⅜	·32
7	Ditto	Ditto, ditto ...	Do. ...	43⅜	·34
8	Paieli ...	Soil rocky, steep, aspect W. ...	A little unsound	32⅔	·25
9	Kawla ...	Ground steep, near jhora, aspect W. ...	Sound ...	101¼	·78
10	Lali ...	Gentle slope, aspect N.-W., under big katus.	Do. ...	22⅕	·17
11	Sisi ...	Gentle slope, aspect N.-W. ...	Do. ...	24	·19
12	Do. ...	Rocky soil, aspect N.-W. ...	Unsound ...	34⅛	·27
			Total ...	436⅜	3·40
			Average ...	39·7	·31
				Maunds	15·5

APPENDIX VIII—*continued.*

ESTIMATION OF CONTENTS OF TYPE TREES—*continued.*

Diameter-class III.

Serial number.	Species.	Situation, soil, &c.	Soundness.	Cubic contents (stacked wood), cubic feet.	Equivalent in cords.
1	Chindia ...	Gentle slope, good soil, aspect N.-W. ...	Sound	106 7/8	·84
2	Kawla ...	Ditto, ditto ...	Do. ...	47 5/8	·37
3	Do. ...	Ditto, ditto ...	Do. ...	64 1/8	·51
4	Arupati ...	Good soil, aspect N.-W.	Do. ...	51 1/3	·40
5	Thali ...	Good soil, on ridge, aspect N.-W. ...	Little rot ..	64	.50
6	Paieli ...	Good soil, slight ridge, aspect N.-W. ...	A little hollow ...	57 5/8	·45
7	Sisi ...	Soil moderately steep: growing in clump	Hollow at base ...	156 1/4	1·22
8	Dudila ...	Rocky soil, aspect N.-W.	A little unsound ...	57	·45
9	Kabashi ...	Good soil in good forest	Unsound ...	114 3/8	·90
10	Búk ...	Rocky ridge, moderate slope, aspect W.	Sound	129	1·01
			Total	848 1/4	6·65
			Average ...	84·8	...
				Maunds	33

Diameter-class IV.

1	Barkholi ...	Soil good, aspect N.-W. ..	Sound ...	185 1/8	1·45
2	Kawla ...	Good soil, slight ridge, aspect N.-W. ...	Do. ...	166 1/4	1·30
3	Sisi ...	Good soil: growing in clump ...	Hollow ...	178 1/2	1·40
4	Dabdabi ...	Rocky soil, aspect W. ...	Unsound .	142 3/4	1·12
5	Phalát ...	Steep ground, rocky soil, aspect N.-W.	Ditto ...	185 1/2	1·45
6	Kawla ...	Slope moderate, ridge, aspect N. ...	Slightly unsound ...	150	1·17
7	Kabashi ...	Good soil, gentle slope, aspect N.-W. ...	Unsound ...	295	2 30
8	Thali ...	Ditto, ditto ...	Rotten, hardly more than a shell.	93 3/4	·73
9	Sisi ...	Steep slope, rocky soil ...	Rotten ...	82 1/3	·64
10	Arupati ...	Moderate slope, aspect N.-W. ...	Sound ...	256	2·00
11	Tarsing ...	Gentle slope, ridge, aspect N.-W. ...	Very nearly sound ...	144	1·12
			Total ...	1,879 1/2	14·68
			Average ...	107·7	1·33
				Maunds	66·5

Diameter-class V.

1	Kawla ...	Slope fairly steep, aspect N.-W. ...	A little rot at base ...	330 3/8	2·58
2	Chindia ..	Soil rather rocky, near jhora, aspect W.	A very little unsound	186 1/8	1·45
3	Kawla ...	Slope moderate, on ridge, aspect N. ...	Hollow ...	260 1/8	2 03
4	Arupati ..	Slope moderate, soil rocky aspect N.-W.	Very hollow ..	212 1/2	1·66
5	Bhadrasi ...	Steep, rocky soil near jhora, aspect W.	Unsound ...	231	1·80
6	Sisi ...	Slope steep, aspect N.-W. .	Ditto ...	177 1/8	1·38
7	Katus ...	Rocky soil, aspect N.-W. ...	Ditto ...	297	2·32
8	Maple ...	Steep rocky soil near jhora, aspect E. ...	Hollow ...	419 3/8	3·28
9	Phalát ...	Steep ground, aspect N.-W. ...	Unsound ..	426 1/2	3·33
10	Barkholi ...	Moderate slope, aspect N.-W. ...	Slightly unsound ...	424	3·31
11	Búk ...	Moderate slope, soil rather rocky, aspect N.-W.	Unsound ...	428	3·34
			Total ...	3,393 1/8	26·48
			Average ...	308 1/2	2·41
				Maunds	120·5